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PROCEEDINGS OF

THE LINNEAN SOCIETY OF LONDON

159th Session (1946–47)

Vol. 159 **Part 1**

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This Journal, which was in abeyance during the war years, is again being published, and a new part (Vol. 5, No. 4) is in the press.

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PROCEEDINGS OF

THE LINNEAN SOCIETY OF LONDON

159th Session (1946–7)

Vol. 159 Part 1

PROCEEDINGS OF THE GENERAL MEETING ON 24 October 1946

Professor G. R. DE BEER, F.R.S., President,
in the Chair.

The Proceedings of the Anniversary Meeting held on Friday, 24 May 1946, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last Meeting :—Dr. A. Becherer, Miss W. M. A. Brooke, The Lady Isabel Browne, Prof. G. D. Hale Carpenter, Mrs. S. S. Flower, Mr. F. C. Grigg, Capt. Eric Hardy, Mr. N. I. Hendey, Mr. A. A. Pearson, Prof. Spoehr, Mr. J. D. Tipper, Mr. B. Vesey-Fitzgerald, Prof. F. E. Weiss, Dr. L. Richmond Wheeler and the University Press, Oxford.

The Assistant Secretary called attention to the portrait in oils of G. D. EHRET, F.R.S., painted by George James, A.R.A., in 1767, which, bequeathed to the Society by Sir Arthur J. Evans in 1942, had recently been received by the Society.

The following Fellows signed the Obligation in the Roll and Charter Book, and were Admitted Fellows :—Sir Nigel Gresley Ball, Bt., M.A., Rear-Admiral Tufton Percy Hamilton Beamish, C.B., G. D. Bhavnani, M.Sc., Winifred M. A. Brooke, Major Maxwell Knight, O.B.E., Harold Philip Moon, M.A., Frank Robert Mumford, Promode Kumar Sanyal, B.Sc., Ph.C., and Brigadier Henry Gilbertson Smith, C.B., O.B.E., M.C., T.D.

A recommendation of the following candidate for Associateship was read for the first time,—Geoffrey Howard Banbury.

The President reported the deaths of the following members :—Mr. Alec William James Haggis, Prof. Bertram Henry Bentley, Dr. John Henry Garrett and Mr. Charles Taborn, Fellows ; Prof. Ludwig Diels, Foreign Member.

The President extended a warm welcome to the following Foreign Guests to the Jubilee Meeting of British Mycological Society who were present at the Meeting,—Dr. N. F. Buchwald (Denmark), Dr. L. Doyer (Holland), Dr. C. W. Emmons (U.S.A.), Prof. R. Falck (Palestine), Dr. Nils Fries (Sweden), Prof. E. Gäumann (Switzerland), Prof. R. Heim (France), Prof. J. Kochman (Poland), Prof. P. Martens (Belgium), Prof. J. B. E. Melin (Sweden), Prof. J. A. Nannfeldt (Sweden), Dr. A. J. P. Oort (Holland), Dr. F. Petrak (Austria), Dr. A. Pilat (Czechoslovakia), and Dr. A. E. Traaen (Norway).

The following communications were read and discussed :—

Dr. K. J. Dormer. The place of gross vascular anatomy in the study of angiosperms. [*cf.* ' Nature ', no. 4021, 23 Nov. 1946.]

Abstract.—

It has been found that the course and connections of the vascular bundles in the stems of dicotyledons admit of a comparative treatment likely to be of value in elucidating the phylogeny of the angiosperms. For this purpose a new terminology has been devised which is independent of ontogenetic considerations and which greatly facilitates the comparison of related vascular systems. A type of vascular system which is believed to be primitive for the angiosperms will be described. It will be shown that the evolution of a typically herbaceous habit is only possible when the primary vascular system is of a particular type. An account will be given of some modifications of the vascular system related to the origin of whorled and decussate phyllotaxy.

Mr. W. R. Philipson. Some observations on the apical meristems of leafy and flowering shoots. [This paper will be published in full in the Journal, Botany.]

Abstract.—

A number of lantern slides were shown illustrating the organization of the meristems found at the apex of vegetating shoots of Angiosperms. The presence of tunica layers enclosing a corpus were noted in each case, but in addition the occurrence of zones within the corpus were pointed out. These zones were :—(i) a central zone of large cells, (ii) a peripheral zone of smaller deeply staining cells, and (iii) a rib-meristem from which the pith was formed. A number of sections through young inflorescences were shown to illustrate Grégoire's interpretation of the reproductive apex. Finally, photographs of the transition from the vegetative to the reproductive state were shown and it was concluded that the two types of apex were related more closely than Grégoire's theory advocated.

Discussion.—

Dr. H. Hamshaw Thomas congratulated the two speakers on the work which they had described in such an interesting manner. They had made it clear that we still had much to discover about the exact structure and mode of development of common flowering plants, while the facts now communicated to the Society suggested that the older views of angiosperm anatomy and morphology would probably require considerable revision. The speaker believed that the neglect of this branch of study by many botanists during the past half century had been mainly due to deductive approach of the older workers, who had preconceptions about the plans of construction of vegetative and reproductive shoots. Dr. Dormer and Mr. Philipson had made a fresh approach to their problems, and if they followed an inductive method they would probably be able to provide much material for the new generalizations needed to elucidate the facts about the evolution of the flowering plants which were gradually accumulating.

Major Hugh B. Cott. The relation between vulnerability and palatability in birds, with special reference to the theory of warning coloration. (Discussed by Dr. Malcolm Smith, Mr. Brian Vesey-Fitzgerald, Mr. F. C. Grigg, Mr. H. R. Hewer and Miss E. Rathbone ; and Major Cott replied.)

Abstract.—

Experiments have been carried out in the Middle East (1941–44) to test the relative palatability of various birds, using the hornet, *Vespa orientalis*, as indicator. Among 38 species examined—which include members of several Passerine families (Oriolidae, Fringillidae, Ploceidae, Alaudidae, Motacillidae Paridae, Laniidae, Pycnonotidae, Sylviidae, Turdidae and Hirundinidae) and of other orders (Coraciiformes, Strigiformes, Piciformes, Ciconiiformes and Columbiformes)—a general inverse correlation between conspicuousness of the plumage and palatability of the flesh is demonstrated : species rated as most palatable include those with the most effective cryptic coloration and habits (*Galerida cristata, Jynx torquilla*) ; while those of lowest-grade edibility are without exception species rendered highly conspicuous in the field by their plumage and behaviour (for example, *Hirundo daurica, H. rustica, Alcedo atthis, Lanius nubicus, Upupa epops, Oenanthe lugens, O. monacha* and *O. leucopyga*). Further experiments and observations suggest that the food preference of the cat and of man are in general agreement with those of the hornet.

The investigation has been extended, in terms of the palatability of the flesh to man, over a wide range of birds, and it appears that the above-mentioned correlation applies in general to birds which are otherwise relatively vulnerable to predatory attack—such species, of many diverse orders, tending to be either cryptic and palatable, or conspicuous and distasteful. This correlation appears to hold even within the limits of different orders and families. On the other hand, relatively non-vulnerable species, of large size, gregarious habits, or with other powers of offence and defence, show no such correlation and often combine conspicuousness with palatability. Bright coloration is thus a general concomitant of relative unacceptability among birds. It is suggested that insufficient weight has hitherto been allowed to the selective action of predation, as opposed to that of the reproductive environment, as a factor in the evolution of conspicuous plumage ; and that even where revealing characters subserve functions other than warning, nevertheless their evolution is likely to have been promoted in the inter-specific struggle as having a subsidiary aposematic function.

PROCEEDINGS OF THE GENERAL MEETING ON 7 November 1946

Professor G. R. de Beer, F.R.S., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 24 October 1946, having been circulated, were taken as read and confirmed.

The President extended a warm welcome to Dr. V. van Straelen, F.M.L.S., and Mr. F. S. Pittock, A.L.S., President of the Photomicrographic Society, who were present at the Meeting.

The following were thanked for gifts made to the Library since the last Meeting :—The Lady Isabel Browne, Dr. G. Rudorf, Dr. W. G. Templeman, Mr. B. Verdcourt, and Dr. T. E. Wallis.

The following Fellows signed the Obligation in the Roll and Charter Book, and were Admitted Fellows :—Mr. Frederick Cyril Grigg, Mr. Norman Sumner Jones, M.Sc., Miss Catherine Muriel Rob and Mr. Patrick Millington Synge.

The following candidate was balloted for and elected an Associate,—Geoffrey Howard Banbury.

The following communications were read and discussed :—

Mr. John Chear, F.L.S. Birds and Man. [A colour film.] (Discussed by the President and Lt.-Col. W. P. C. Tenison, D.S.O.)

Dr. V. van Straelen, F.M.L.S. The Belgian National Park, Congo Belge. (Discussed by Mr. Henry G. Maurice, C.B., P.Z.S., Prof. A. J. E. Cave, Mr. E. Milne-Redhead, Lt.-Col. W. P. C. Tenison, D.S.O. and Miss E. Rathbone ; Dr. van Straelen replied.)

PROCEEDINGS OF THE GENERAL MEETING ON 21 November 1946

Professor G. R. de Beer, F.R.S., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 7 November 1946, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last Meeting :—Dr. L. F. de Beaufort, Mr. R. J. A. W. Lever, the East African Agricultural Research Institute, Amani, and the Smithsonian Institution, Washington.

The following Fellows signed the Obligation in the Roll and Charter Book, and were Admitted Fellows :—Mr. Gerald Mortimer Ash, Mr. William Ernest Dick, Mr. John Leslie Rees and Dr. David Henriques Valentine.

The President reported the death of Lilian Alice Mabel, Lady Richmond-Brown, a Fellow of the Society.

The following communications were read and discussed :—

Dr. R. Melville and Mr. Magnus Pyke. The influence of inherent variability and environment on the Vitamin C content of British Roses. [Printed in full below.]

Mr. A. H. G. Alston. Systematic Botany and Botanical Collections in Germany. (Discussed by Dr. J. Ramsbottom, O.B.E., Colonel F. C. Stern, O.B.E., M.C., and the President ; Mr. Alston replied.)

Dr. A. Tindell Hopwood. Contributions to the Study of some African Mammals.—IV. The Skulls of Lion, Leopard and Cheetah. (Discussed by the President and Prof. A. J. E. Cave ; Dr. Hopwood replied.) [This paper will be printed in full in the Journal, Zoology.]

Abstract.—

The skulls differ considerably from each other. That of the Lion is the most primitive and has the smallest brain proportionately ; the Leopard's skull is that of a ' normal feline ' ; and that of the Cheetah is most specialized.

Dr. Frank W. Jane. A new species of *Chlororhabdion.* (Discussed by the President, Mr. F. C. Grigg and Dr. B. Barnes ; Dr. Jane replied.)

Abstract.—

The genus *Chlororhabdion* was recently erected for a small epiphytic xanthophycean alga (Jane, Journ. Roy. Microsc. Soc. **64**, 16–25 (1944).

Clearly a member of the Characiopsidaceae, *Chlororhabdion* is distinguished from other genera of that order by its peculiar method of asexual reproduction : the whole contents of the plant segment into spores, of which the proximal one normally remains within the sporangium to form a new, unattached plant, while the others escape as uniflagellate zoospores.

A second species of the genus has now been found, similar in most respects to that previously described (*C. Diogenes*), from which it differs, principally in its curved and not erect, clavate shape.

THE EFFECT OF SPECIFIC VARIABILITY AND THE ENVIRONMENT ON THE VITAMIN C CONTENT OF BRITISH ROSE HIPS.

By RONALD MELVILLE and MAGNUS PYKE.

(With a text-figure.)

Vitamin C, 1—ascorbic acid, is one of the vitamins essential for the maintenance of health and in a balanced diet is supplied by fresh vegetables and fruit. Healthy adults are able to obtain all they need from vegetables, but infants and invalids rely mainly on fruit and fruit juices. The drastic curtailment of fruit supplies brought about by the war was responsible early in 1941 for grave concern that the health of infants would suffer. The crop of blackcurrants, richest of the cultivated fruits, was set aside for the preparation of syrups and purées suitable for infant feeding and a search was made for alternative sources of vitamin C.

Russian workers [1] had shown that the hips of certain roses were rich in the vitamin and Bukin and Zubkova had reported the remarkably high figure of 4·75 per cent in the raw-hip flesh of *Rosa acicularis*. Little was known, however, of the Vitamin C content of the British rose hips. The only information available was contained in a paper by Goldberg and Walsh [2] who had found amounts varying up to 416 mg. per 100 gms. in the fresh fruit of *R. canina* growing in Hertfordshire. In view of the Russian work, it seemed likely that higher concentrations might occur in other native roses. A survey of the Vitamin C content of British rose hips was therefore undertaken. Its success was due in large measure to the co-operation of the Ecological Society, which issued an appeal to its members to supply samples of hips together with specimens from the same bushes for checking the identifications. Hip samples were received from numerous localities ranging from the southern counties to Angus in Scotland.

The vitamin C estimations were made by the dye titration method using 2 : 6-dichlorophenolindophenol as described earlier [3]. The hip flesh alone was analysed as little, if any, ascorbic acid occurs in the achenes. The flesh of five or more ripe hips was ground up together for each estimation, so that the values obtained represent a mean for each bush and errors due to the variability of individual hips were minimized. The results are expressed as milligrams of ascorbic acid per 100 gms. of hip flesh, hereafter called ‘ mg. per cent ’. Similarly, the values given for the proportion of achenes, expressed as a percentage of the weight of the hips, are means. Hips were sent by post and generally were analysed within a few days of the date of picking ; if delay was unavoidable they were kept in cool storage.

It was soon evident from the analyses that the native rose hips would provide a valuable source of vitamin C. Information of value for the exploitation of the rose-hip crop was circulated to interested departments and organizations without delay and a digest of the chemical data was later presented to the Biochemical Society. Owing to lack of time, critical study of botanical aspects of the work was postponed.

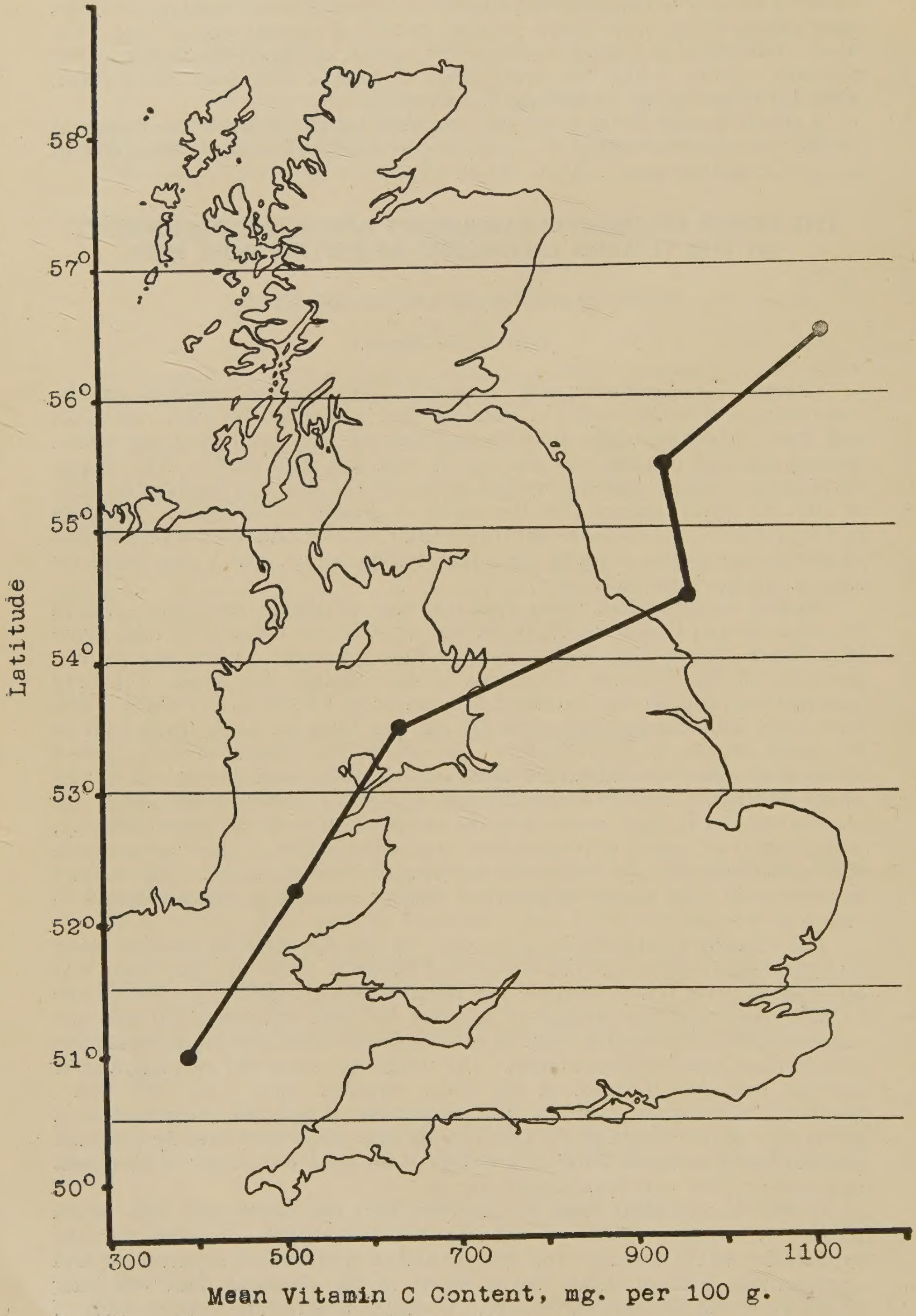

FIG. 1.—Variation with latitude of the mean Vitamin C content of the ripe hip flesh of British rose populations.

The identification of specimens was at times difficult, due partly to fragmentary material and partly to the lateness of the season. Several tentative determinations made at the time were found later to need revision and in a few instances, where hips of two species or varieties had been mixed, the results had to be discarded. The results of some later analyses have been included, however, and for these reasons the summary of the data presented in Table I differs slightly from that originally published.

The nomenclature adopted is that of Wolley-Dod's monograph [4], for, though it does not always conform to the International Rules, it has the advantage of ready availability. The revision of the nomenclature would be a lengthy task and should be accessory to a critical revision of the British roses. The identifications therefore have been made in the sense of Wolley-Dod's monograph, while reserving opinion as to the status of some of the entities described.

TABLE I.—Vitamin C Content of hip flesh, Percentage weight of Achenes in Hips and Chromosome Numbers of British Roses.

Rosa sp.	No. of samples	Ascorbic acid mg./100g. hip flesh		Achenes, weight per cent		Chromosome numbers
		Range	Mean	Range	Mean	
mollis	11	720–1655	1303	15–51	29	28
Sherardi	20	650–2810	1249	26–55	36	35
Afzeliana	15	595–1600	1114	21–46	37	35
coriifolia	18	500–1820	924	21–43	34	35
rubiginosa	4	550–1225	818	38–49	44	35
tomentosa	16	235–865	544	29–55	38	35
dumetorum	36	105–855	524	28–55	38	35
canina	79	100–1055	493	24–59	39	35
agrestis	1	500	500	33	33	35
micrantha	6	240–650	416	34–49	42	35
obtusifolia	14	145–670	418	33–59	44	35
spinosissima	6	145–760	324	21–29	24	28
stylosa	9	70–380	216	32–48	39	35
arvensis	28	10–165	75	26–49	36	14

A wide range in the vitamin C content of the ripe hip flesh of British roses was found, from 10 mg. per cent in some samples of *R. arvensis* to 2810 mg. per cent in one sample of *R. Sherardi*. The variation within species also was considerable, and it is of interest to enquire to what extent this is due to inherent variability or to the effects of environmental factors.

The lowest mean value, 75 mg. per cent, occurred in *R. arvensis*, our only diploid species. The highest mean value, 1303 mg. per cent, was found in *R. mollis*, a tetraploid, while the only other tetraploid, *R. spinosissima*, was one of the three species poorest in the vitamin. The remaining species are all pentaploids and their means cover almost the whole range found in our flora from 216 in *R. stylosa* to 1249 in *R. Sherardi*, which also provided the highest individual assay. A single octoploid individual has been reported in *R. mollis*, but there is no reason to suspect that the specimens of this species examined were other than tetraploids. There is, therefore, no evidence from the British species for a close correlation between vitamin C content and chromosome number as suggested by Darlington [5].

Eleven of the 14 British species are pentaploids with a somatic chromosome complement of 35. In general these are highly polymorphic and provide the taxonomist with a number of problems. Wolley-Dod describes in his monograph 44 varieties or forms of *R. canina* and 19 of *R. dumetorum*, perhaps the two most intensively studied of the pentaploids. On the other hand, he includes only seven varieties of the diploid *R. arvensis*. The number of described forms by no means conveys a complete picture of the variability of the polyploids, for the classification is based mainly on a limited number of foliage, stem and fruit characters and more or less ignores numerous minor differences of morphology. Each name is applied to a larger or smaller group of entities, while in the field it is often difficult to find two bushes exactly alike. There is perhaps small wonder that a variable morphology is matched by great variation in a chemical character like vitamin C content.

The significance of the differences between the mean vitamin C content of certain pairs of species was tested by the application of the ' t ' test [6] (Table II).

TABLE II.—Significance of Interspecific differences in mean Vitamin C content of Rose hip flesh.

Rosa sp.	Mean vitamin C. content mg./100g.	Diff. of mean	'n'	't'	p'
obtusifolia..........	418	126	26	1·743	0·1
tomentosa	544				
Afzeliana	1114	190	31	1·696	0·1
coriifolia	924				
obtusifolia..........	418	506	30	4·91	<0·01
coriifolia	924				

With samples of about 15, differences of 100–200 mg. per cent were not significant, though a difference of 500 mg. per cent was highly significant. Probably a difference between means of about 300 mg. per cent would be required to fall within the 5 per cent probability limit under the existing variability with samples of 15.

TABLE III.—Varietal differences in Vitamin C content of hip flesh and Percentage weight of Achenes in the hips.

Rosa canina	No. of observations	Mean vitamin C content mg./100g.	Range of vitamin C content mg./100g.	Mean weight of achenes per cent
Section Lutetianae :				
var. *lutetiana*	10	508	365–705	39
,, *sphaerica*	6	405	224–605	43
,, *senticosa*	5	633	415–1010	40
Section Transitoriae :				
var. *spuria*	7	638	385–1055	37
,, *globularis*	4	428	120–795	44
,, *ramosissima*	4	470	235–685	40
Section Dumales :				
var. *dumalis*	14	489	100–850	37
,, ,, f. *viridicata*.......	6	506	445–610	40
,, ,, f. *cladoleia*	4	419	215–510	36
,, *biserrata*	3	450	410–490	40
,, *fraxinoides*	5	458	205–625	35
,, *sylvularum*	4	601	370–815	36
Section Lutetianae	21	508	224–1010	
,, Transitoriae	15	537	120–1055	
,, Dumales	36	482	100–850	
Rosa dumetorum				
var. *typica*	3	607	590–745	38
,, ,, f. *urbica*	9	529	130–790	38
,, ,, f. *semiglabra*.........	8	502	200–795	36
,, *hemitricha*	7	529	260–855	36

High variability within a species might exist as a result of complete absence of linkage between vitamin content and gross morphological characters, or alternatively, if there was close linkage within the varieties and wide differences between the varieties. From an examination of the data for the varieties of *R. canina* and *R. dumetorum* (Table III) it is evident that the variability that marks the species extends also to the varieties.

The range of vitamin content encountered in the varieties *globularis* and *dumalis* of *R. canina* was almost as great as in the species as a whole. The significance of the differences of the varietal means was tested, but none was significant. Even when the varieties of *R. canina* were grouped into the three sections of the Wolley-Dod classification, *Lutetianae, Transitoriae* and *Dumales*, the differences between the sectional means were not significant. It appears, therefore, that no correlation exists between vitamin C concentration in the hip flesh and the morphological characters used for classification in *R. canina.*

The four British species with the highest vitamin C contents, *R. mollis, R. Sherardi, R. Afzeliana* and *R. coriifolia,* have one character in common: The sepals remain erect in the ripe fruit. In *R. mollis* and *R. Sherardi* this feature is accompanied by a fleshy development of the base of the sepals that prevents or delays their fall as the fruit ripens. Chailakhyan [7] has observed a similar correlation between high vitamin content and persistently erect sepals in certain Armenian roses and, in a recent paper, maintains that the correlation holds for the genus as a whole. As an explanation, he advances the theory that ascorbic acid has a growth stimulating effect which prolongs the growth of cells at the bases of the sepals and so accounts for their continued erection and persistence. Other Russian work indicating that the vitamin has a stimulating action on growth is quoted in support of the thesis.

Two native species, *R. coriifolia* and *R. Afzeliana,* are of particular interest in connection with Chailakhyan's hypothesis, as each is divided into two groups, one with sepals erect, the other with sepals reflexed or spreading.

TABLE IV.—Sepal character and Vitamin Content.

Species	Variety	No. of observations	Mean vitamin C content mg./100g.	Group means	Sepals
R. coriifolia	*typica*	3	1013		
Typicae	*Watsoni* f. *subhispida*	4	1133		
	Bakeri	2	934	1027	erect
Subcollinae	*subcollina*	1	1040		
	subcoriifolia	4	761		
	Lintoni	4	776	859	reflexed
R. Afzeliana	*Reuteri*	6	1146		
Reuterianae	*glaucophylla*	3	1012		
	stephanacarpa	2	1205		
	oenensis	2	1018	1095	erect
Subcaninae	*subcanina*	2	1175	1175	reflexed

The number of observations on varieties of these species varies from one to six; so that the varietal means have been used in comparing the groups (Table IV) to avoid giving undue bias to any one variety. In *R. coriifolia* the group Typicae, with erect sepals, has an appreciably greater vitamin C content than the Subcollinae with reflexed or spreading sepals. Unfortunately, in *R. Afzeliana* the Subcaninae, with reflexed sepals, is represented by only one variety and two observations. No reliance can therefore be placed on the difference between the two groups in this species which happens to be slightly in favour of the Subcaninae. The comparison in *R. coriifolia*, however, strongly supports Chailakhyan's hypothesis.

At one stage in this research it appeared probable that earliness of ripening was correlated with a high concentration of vitamin C. This theory was the outcome of the observation that the richest of our native species are also those that ripen first. The earliest to ripen is *R. mollis*, followed by *R. Sherardi*, *R. coriifolia* and *R. Afzeliana*. Species with moderate vitamin contents ripen next, among them *R. canina*, *R. dumetorum*, *R. rubiginosa*, *R. micrantha* and *R. tomentosa*. The latest to ripen of all the British species is *R. arvensis* and this also has the lowest vitamin content. The richest species examined in 1941, *R. Fedtschenkoana*, one sample of which contained 4800 mg. per cent of vitamin C in the fresh hip flesh, also ripened early in the season. With justifiable eagerness the earliest species of all were sought out in 1942, as it seemed likely that they might have even higher vitamin contents. *R. omeiensis* Rolfe had ripe hips in the first week in July, a full month before *R. mollis*, but its vitamin C content was only 150 mg. per cent. Other related early ripening species were also poor in the vitamin, so the hypothesis that earliness of ripening was correlated with vitamin content had to be rejected.

The vitamin C content of the hips of individual bushes was found to vary appreciably, though much less than for species. A series of analyses of hips of a bush of *R. mollis* f. *glandulosa* growing at Twickenham, revealed a concentration in the hip flesh of 1486 mg. per cent in 1941, 1655 in 1942, 1651 in 1943 and 1309 in 1944. The range from maximum to minimum of 346 may be compared with the species range of 935. These analyses were all made on full-red hips as the vitamin content varies through the season while the hips grow and ripen. Bushes of three species were examined at intervals, in order to follow the changes in vitamin C concentration. In all three, the vitamin concentration increased up to the stage of full ripeness. Other observations indicated that the changes in vitamin content were comparatively slight after the fruits had reached the orange-red stage. Although in these experiments the maximum vitamin content was reached for all the species tested at the full-ripe stage, Shröderheim[8] working in Sweden, obtained somewhat variable results. He observed the maximum concentration in some species before the stage of full ripeness, as judged by colour and consistency of the hip flesh. Even in one species the maximum was found at various developmental stages in different seasons and localities and it appears that climate and environmental conditions have some effect on the time of occurrence of the maximum.

TABLE V.—Seasonal progression of Vitamin C content.

Species	Date	Stage of ripeness	Vitamin C in hip flesh mg./100g.
R. dumetorum	6. 7. 42	Green	385
Kew, No. 250	5. 8. 42	Yellow-green	560
	25. 8. 42	Full red	935
R. rubiginosa	12. 9. 41	Yellow-red to red	635
Kew, No. 12	14. 10. 41	Red	745
	12. 11. 41	Full red, starting to soften	995
R. mollis f. *glandulosa*	20. 7. 42	Green	980
Twickenham	5. 8. 42	Green, yellowing	990
	25. 8. 42	Full red	1655

The nature of the soil was one of the environmental factors considered likely to affect the vitamin content of the hips. Information about the soil was obtained for many of the samples and sufficient data were available on the four pentaploid species *R. canina*, *R. dumetorum*, *R. obtusifolia* and *R. tomentosa* to warrant an examination for possible soil effects.

TABLE VI.—Mean Vitamin C content of hip flesh of four pentaploid Roses growing on different soils.

Soil	No. of observations	Vitamin C, mg./100g.	
		Mean	Range
Clay	37	520	105–855
Sand	15	525	224–790
Loam	15	462	120–1055
Chalk	30	462	100–1010

Group means for the soil types clay, sand, loam and chalk are given in Table VI. The relatively acid soils, clay and sand, sustained a rose population somewhat higher in vitamin C content than that of the neutral or alkaline loam and chalk soils. As the observations on clay and chalk soils were most numerous, the significance of the difference between the two means was tested by the ' t ' test. The difference of 58 was not significant ($p=0{\cdot}2$) and although the means suggest that acid soils are slightly more favourable than basic soils to the development of a high vitamin content in the hips, the result is inconclusive. Similar conclusions have been reached by other workers. Bernstein, Hamner and Parks[9] found only minor fluctuations in the vitamin C content of turnip greens grown in sand culture under different fertilizer levels except in complete deficiencies. Similarly, James[10], working on the cabbage, and Karikka, Dudgeon and Hauck[11], on the potato, found little or no effect on vitamin C content with various rates of application of fertilizers. Soil conditions therefore, appear to be relatively unimportant in determining vitamin C content in plants.

Early in the investigation it was evident that, on the whole, hips coming from the northern parts of the country were richer in vitamin C than those from the south. Bukin and Zubkova[1] had recorded previously that rose hips from northern latitudes in the U.S.S.R. contained more vitamin than those from further south, and they implied that this applied to species as well as rose populations.

TABLE VII.—Variation with latitude in the composition of British rose populations and the mean Vitamin C content of the hip flesh.

Species	No. of observat:ons in Latitude Zones of :—					
	50·5–51·5°	51·5–53°	53–54°	54–55°	55–56°	56–57°
arvensis	20	4	4	—	—	—
stylosa	8	1	—	—	—	—
spinosissima	2	—	2	1	—	1
spinosissima hybrids	—	—	—	—	—	2
obtusifolia	13	1	—	—	—	—
micrantha	3	3	—	—	—	—
agrestis	1	—	—	—	—	—
canina	42	20	14	2	—	2
dumetorum	17	10	7	—	1	1
tomentosa	10	1	3	—	—	1
rubiginosa	3	—	—	—	—	1
coriifolia	—	—	—	4	4	9
Afzeliana	1	1	2	5	4	2
Sherardi	—	1	6	4	2	5
mollis	—	—	1	5	—	1
Totals	120	42	39	21	11	25
Mean Vitamin C content of hip flesh mg./100g.	390	513	635	966	935	1117
Weight of achenes in hips, per cent	39	37	36	35	40	35

For the examination of the latitudinal correlation, the data were grouped into zones of one degree of latitude with the exception of the South Midlands zone, which for convenience extended from 51·5–53° N. latitude. The mean vitamin C content of the rose populations of each zone was then determined and it was found that there was a fairly regular and striking increase in vitamin content in progressing from south to north. The greater part of the latitudinal variation can be accounted for by changes in the relative proportions of different species in the wild rose populations. Scrutiny of Table VII indicates that the species poorest in the vitamin, *R. arvensis* and *R. stylosa*, were obtained only from the south, and the richest species, *R. mollis*, *R. Sherardi*, *R. coriifolia*, *R. Afzeliana*, came predominantly from the north. The most numerous samples from the south were from *R. canina* and *R. dumetorum*, species with only moderate vitamin contents.

The collections from the three southern zones of latitude, extending to latitude 54° N., were sufficiently numerous to provide a fairly representative sample of the populations in these areas. Moreover, they came from people who were not specialists in the genus *Rosa*, so that there was unlikely to be any bias in the selection of samples. Collections from the three northern zones of latitude, from Latitude 54 to 57° N., were much less numerous, and as some of the samples were collected by botanists interested in the taxonomy of the genus, the possibility of bias in the selection of bushes to sample cannot be ruled out. If the factors governing the latitudinal variation act uniformly, the curve connecting vitamin content with latitude (fig. 1) should be smooth. The mean vitamin content for the zone 54–55° N. must then be considered higher than expectation. This zone includes the county of Durham and the Lake District, areas in which *R. mollis* is frequent. It is possible that *R. mollis* was over-represented in the collections from this zone and it should have been included in the next zone, 55–56° N. Latitude, from which no sample was received and which has in consequence a lower mean than it should. With these reservations, it is probable that the sampling was satisfactory.

Exact information on the relative abundance of the native rose species in different parts of the country is lacking. As a rule only the presence or absence of a species is recorded. *R. arvensis* is abundant in the southern counties and thins out north of Latitude 53° and is present in only a few Scottish counties. *R. stylosa* reaches about as far north as the Wash and *R. obtusifolia* to Yorks. *R. canina* and *R. dumetorum* are abundant in south and central England, but further north they tend to be replaced gradually by *R. Afzeliana* and *R. coriifolia*, although there are places in the western Highlands and the Islands where *R. canina* is not uncommon. Possibly this is related to the extreme Atlantic climate and relatively high winter temperatures of this part of Scotland. *R. mollis* and *R. Sherardi* have a northern distribution, *R. mollis* sending few outliers south of Latitude 53° N., though a few varieties of *R. Sherardi* extend southward even as far as Devon. The distribution of the species and the differences in their vitamin contents therefore appear to be sufficient to explain the observed correlation between latitude and the mean vitamin content of collections of rose hips without invoking any other factor.

As Bukin and Zubkova had claimed that the hips of individual species vary in vitamin content with latitude the data were examined from this point of view. The mean vitamin content of the hip flesh of four species for each zone of latitude are presented in Table VIII. In none of these is there any regular gradation of vitamin content with latitude and from the statistical tests already carried out it was evident that none of the differences is significant. Nevertheless, the means for the two southernly zones of latitude are in each species lower than for the northernmost zone. The evidence from the British species for a direct correlation between latitude and vitamin C content is therefore not very strong. Moreover, a bush of *R. mollis*, which had been transplanted from the Lake District to the London area for ten years, continued to yield hips as rich as those from other examples of the species in its original latitudinal zone. Although too much weight must not be placed on a single transplant experiment, it does suggest that a mere exchange of one set of environmental conditions appropriate to one latitudinal zone for those of another zone does not have any profound effect on vitamin content. One is led to assume that the major control of vitamin C content in rose hips is genetical and is influenced to a minor extent only by short term environmental conditions. Over longer periods, environmental differences correlated with latitude have doubtless played a part in guiding the evolution of the roses and selecting species with high vitamin content in the higher latitudes.

TABLE VIII.—Variation in the mean Vitamin C content of individual species with latitude.

Mean vitamin C content, mg./100g. for latitudinal zones.

Species	50·5–51·5°	51·5–53°	53–54°	54–55°	55–56°	56–57°
canina	480	524	487	380	—	578
dumetorum	474	640	467	—	—	795
Sherardi	—	1385	1313	844	968	1794
Afzeliana	780	595	1322	1141	1043	1405

The numbers of observations on which the means are based are given in Table VII.

This conclusion was borne out by an examination of the available data on the intensity and duration of daylight during and immediately preceding the period of the investigation. One of the most marked changes in the environment associated with high latitudes is the increase in the length of day. If there were a direct effect of length of day on vitamin C content it should be manifested by a change in the concentration in ripe hips of a single species as the season advances. Observations on *R. canina* (Table IX) did not support this hypothesis, which would require a regular decrease in the vitamin content of the red hips as the length of day decreased from September onwards. If there was any such effect, then it was masked by changes in vitamin content associated with maturation of the fruit.

TABLE IX.—Seasonal progression of mean Vitamin C content in the ripe hip flesh of *Rosa canina* and bright sunshine.

Date		Sept. 23–30	Oct. 1–14	Oct. 15–31	Nov. 1–16.
No. of observations		22	21	22	8
Mean Vitamin C content mg./100g.	Range	164–1010	100–830	120–1055	115–850
	Mean	497	417	527	527
Total hours of bright sunshine	Current fortnight	56·4	39·6	51·4	40·1
	Current fortnight & preceding fortnight	116·7	96·0	91·0	91·5

Several investigators have reported a higher vitamin C concentration on the sunny side of apples than on the shaded side, and McCollum [12] has observed a similar effect on tomatoes. Reid [13], working on cowpeas, found that a relatively high concentration of vitamin C occurred under conditions of high daylight intensity and medium or long days and that low light intensity and short days had a depressing effect. In the present work the only available measure of daylight intensity was the records of a Campbell–Stokes sunshine recorder. No close correlation was found between the number of hours of bright sunlight occurring during the fortnightly periods in which the vitamin C observations on *R. canina* are grouped in Table IX, nor between the total number of hours of bright sunshine in the current fortnight and the preceding fortnight.

This lack of correlation may be accountable for in part by the fact that the sunshine records were taken at Kew, while the hip samples came, with few exceptions, from a wide area in Southern England. This dispersal factor does not enter into the comparison of sunlight records and vitamin C content of plants growing in Kew and its immediate neighbourhood. Comparable figures are available for individual bushes of *R. dumetorum* and *R. mollis* f. *glandulosa* extending over a period of four years (Table X). The number of hours of bright sunlight in the month preceding the collection of the hips does not appear to be closely correlated with vitamin C content. Corresponding totals for sunlight for one, two or three weeks preceding collection showed an even poorer fit. The investigation, therefore, provided no evidence of any major effect of either length of day or of light intensity on the vitamin C content of rose hips. Changes of a few milligrams per 100 gm. such as have been observed in apples and tomatoes would be insignificant in rose hips with their high vitamin content and great variability.

TABLE X.—Bright sunshine and Vitamin C content of the hip flesh.

Species	Date	29. 8. 41	25. 8. 42	7. 9. 43	12. 9. 44
R. dumetorum	Vitamin C content mg./100g.	918	935	957	685
	Hours of bright sunshine in month before picking	150·3	141·5	156·6	134·0
	Date	16. 8. 41	25. 8. 42	7. 9. 43	23. 8. 44
R. mollis f. *glandulosa*	Vitamin C content mg./100g.	1486	1655	1651	1309
	Hours of bright sunshine in month before picking	138·1	141·5	156·6	166·2

The fertility of the hips, measured by the weight of achenes expressed as a percentage of the weight of the entire hips, has been claimed by Gustafsson and Schröderheim [14] to influence the vitamin C content of the hip flesh. These workers published data purporting to show that hip fertility was negatively correlated with vitamin C content. In a note [15] published at the time, an examination of the data for *R. canina* obtained in this research was made and a very low and non-significant negative correlation ($r=-0{\cdot}10$, $p=0{\cdot}4$–$0{\cdot}3$) was obtained. It was pointed out that the correlations found by Gustafsson and Schröderheim were fallacious on account of the mingling of hips from species having a high vitamin content and a low percentage weight of achenes with others in which low vitamin content was combined with a high proportion of achenes. Moreover, the more heterogeneous the mixture, the higher and more significant the correlation they obtained.

Mean values for the percentage by weight of the achenes in the hips of the British species are included in Table I, together with the range of variation in this character. The lowest mean, 24 per cent, was found in *R. spinosissima*, which was one of the poorest in the vitamin. The species poorest in vitamin C, *R. arvensis*, had a moderate mean achene content of 36, while *R. mollis*, richest in the vitamin happens to possess the rather low mean for achenes of 29. The proportion of achenes in normally fertile hips appears to be unrelated to vitamin content and depends upon the conformation of the hip itself. Hip shape varies considerably in different species. The flesh is thick in *R. spinosissima* and thin in *R. arvensis*. Species differ also in the fleshiness of the base and the neck of their hips. Hip shape, proportion and weight are specific characters each with its own mean and range of variation and apparently unrelated to vitamin content.

The conclusion may be drawn that vitamin C content is a character inherent in each species and variety and depending on its hereditary constitution. Environmental factors, such as the nature and composition of the soil and light intensity, appear to do no more than induce slight modulations of the inherited vitamin content. The great variability of the species with high vitamin contents is probably due to their polyploid nature. Among the pentaploids variability may be enhanced by the unusual method of reproduction that involves the fusion of a tetraploid egg cell with a haploid pollen nucleus. Moreover, it is likely that in the field the various pentaploid species share their pollen. The progeny are matriclinal on account of the preponderance in their constitution of characters from the female parent. The species in the resultant pentaploid complex are linked by transitional forms and confound the taxonomist in his efforts at classification. The great variation in morphology and vitamin C content can thus be regarded as the result of a complex inheritance.

It is a pleasure to record our appreciation of the assistance rendered by the council and members of the Ecological Society and other botanists for their ready response to an appeal for samples of rose hips, and to Mr. N. Y. Sandwith for discussing the taxonomy and assisting in the identification of some of the material. We are greatly indebted to the directors of Messrs. Vitamins Ltd. for their generosity and public spirit in placing the facilities of their laboratories at our disposal and for the cooperation of their research staff in making the vitamin C analyses.

SUMMARY.

(1) The vitamin C content of the hip flesh of fourteen British Rose species was determined by the dye titration method.

(2) The mean vitamin C content ranged from 75 mg. per cent in *R. arvensis* to 1303 mg. per cent in *R. mollis* ; variation within species and varieties was considerable.

(3) No close correlation was found between vitamin C content and chromosome number.

(4) Some evidence was found in favour of Chailakhyan's hypothesis that high vitamin content is associated with persistently erect sepals.

(5) An apparent correlation between earliness of ripening and high vitamin content broke down when non-British roses were examined.

(6) The rose populations of relatively acid soils provided slightly richer hips than those of basic soils, but the difference was not significant.

(7) The vitamin C content of rose hip populations increased fairly regularly in passing from low to high latitudes, due to the localization of high yeilding species in the north and the poorer species in the south. No correlation could be demonstrated between vitamin C content and latitude within the species.

(8) No significant evidence was found for an effect on vitamin content due to light intensity or length of day.

(9) The fertility of the hips, measured by the proportion by weight of the achenes to total hip weight, was not correlated with vitamin C content and apparent correlations were due to specific differences in hip shape.

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PROCEEDINGS OF THE GENERAL MEETING ON 12 December 1946

Colonel F. C. Stern, O.B.E., M.C., Vice-President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 21 November 1946, having been circulated, were taken as read and confirmed.

A letter, dated 4 December 1946, from the President to the Minister of Town and Country Planning was read, deploring the enclosure of areas, many of which were in Wales, as training grounds for the Forces. These areas contain examples of rare animals and plants.

The following were thanked for gifts made to the Library since the last Meeting :—Dr. R. E. G. Armattoe, Mrs. D. Flower, Dr. R. Gurney, Dr. E. D. Merrill, Dr. V. Tchernavin and Professor F. E. Weiss.

The Vice-President in the Chair welcomed the presence at the Meeting of Professor E. Fischer-Piette of the Paris Museum, who invited as many zoologists as possible to attend the next International Zoological Congress, which would be held in Paris, probably in June or July 1948.

The following communications were read and discussed :—

Dr. T. H. C. Taylor. An example of Biological Control. (Discussed by Mr. I. H. Burkill, Dr. F. A. Evans and Dr. E. Trewavas ; Dr. Taylor replied.)

Abstract.—

The predacious mite, *Pediculoides ventricosus* Newp., accidentally introduced into Fiji, upset the balance normally existing between the coconut leaf-mining beetle, *Promecotheca reichei* Baly, an indigenous insect, and its indigenous parasites. Severe outbreaks of the beetle resulted, and in order to control it a parasitic insect, *Pleurotropis parvulus* Ferr., specially selected to operate in the new conditions created by the mite, was introduced from Java.

Dr. E. M. Delf, F.L.S., and Miss M. Naylor. An unusual type of emission of oospheres in a British species of *Fucus*. (Discussed by Dr. A. C. Halket, Dr. J. W. G. Lund and Dr. B. Barnes; Dr. Delf replied.) [Printed in full below.]

Dr. M. G. Calder. Pseudangiospermy and Pollination. (Discussed by Dr. H. Hamshaw Thomas, M.B.E., F.R.S.) [Printed in extended abstract below.]

AN UNUSUAL TYPE OF EMISSION OF OOSPHERES IN A BRITISH SPECIES OF FUCUS.

By E. M. Delf and M. Naylor.

There are three common species of *Fucus* which take up characteristic positions on the shores of Britain. Of these, *Fucus spiralis* occurs in the upper regions of the area between high and low neap tides, sometimes extending even higher, as at Plymouth and in certain parts of the coast of Essex; or it may occur lower down, nearly to the low water, neap level, as in Holland (Zanefeld, 1937). Thus *F. spiralis* usually spends rather more than half its time out of water; but at neap tides the highest plants remain uncovered for at least twenty-four hours on end.

The coast of Essex is not usually held to be favourable for the study of seaweeds, but near Stanford le Hope, it is reported by Miss M. Naylor of Westfield College, that *F. spiralis* occurs on the sea wall in a zone extending about 1 ft. above high water neaps and some 2–3 ft. below it. The aspect here is south to south-east, although Zanefeld found that in Holland, sunny positions were avoided.

In July (1946) visiting Stanford at a low spring tide when the plants had been exposed for some eight hours, Miss Naylor noticed that almost every fertile plant had little strings hanging from the ostioles. By careful handling fertile tips were brought to the laboratory intact for examination. The strings were found to be tough and to consist of egg-packets, joined end to end, with here and there antheridia or antheridial packets (i.e. of antheridial mother cells) entangled in the mucilage which surrounded the whole. The oogonia are, of course, scattered all over the inner surface of the conceptacle. Sections showed that many oogonia must have ripened simultaneously and shed their contents into the cavity of the conceptacle; occasionally some could be seen ranged vertically below the ostiole. Owing to the large size of the egg-packets relative to the ostiole, it is natural that they should pass out in succession, but I do not think that anything like these firm chains have previously been recorded for any species of *Fucus*, or indeed, for any member of the Fucales, with the possible exception of *Ascoseira*.

Subsequent observations on the same site show that the formation of chains is by no means invariable. On Aug. 2, a damp rainy day, only two tips with extruded strings were noticed, the majority having mucilaginous drops around the ostioles in the manner first described by Thuret (1875). On October 7, a cold sunny day, a few short chains began to emerge about eleven o'clock. In plants brought to the laboratory and left to dry, the chains slowly lengthened, one containing as many as 50 egg-packets in series. As a rule, the number of packets in a chain varied from 12–20; occasionally two or even three shorter chains depended from the same ostiole.

Apparently these chains are resistant to desiccation, for their eggs and sperms were quite fertile when wetted more than twenty-four hours after extrusion. This would appear to be another manifestation of the law enunciated by Zanefeld (1937) that of the three species of *Fucus*, the higher the position on the shore, the longer can water be retained in the tissues when exposed to desiccation.

The chain-like arrangement of the reproductive elements is reminiscent of the descriptions of the antarctic genus *Ascoseira*, discovered by Skottsberg. This plant bears conceptacles from the lining of which arise long uniseriate fertile hairs. Each cell of these is originally uninucleate, but undergoes two successive nuclear divisions in a manner recalling the fucoid oogonium and producing eight presumably reproductive units cohering together. In some of the conceptacles the cells of the filament appear to have broken up, but here and there are signs of chain formation, and in one preparation (Skottsberg 1923, fig. 20*f.*) a chain of these coherent units is seen passing through the ostiole. It is not clear from the descriptions whether these coherent units are still enclosed by the mother wall ; probably their small size, the poor state of preservation and the effects of treatment needed for embedding in paraffin made this difficult to determine.

Through the kindness of Professor Carl Skottsberg, F.M.L.S., I have recently had the opportunity of seeing some of his preparations and also of examining a small piece of the fertile material sent at the same time. In spite of the unsatisfactory preservation, there seems little doubt that many of the coherent units are quite free of any surrounding wall ; in hand sections of the material (previously soaked out) remains of delicate walls could be seen closely associated with and obviously fitting the packets of eight Around the latter a thin refractive film suggested a common layer of mucilage, but on swelling with dilute potash the whole broke up before any stratification could be detected. It thus appears that these reproductive units, whatever their nature and function, have a considerable resemblance to the oogonia of the Fucales not only in their development but in the release of the products of division into the cavity of the conceptacle. The curious release of chains of ' eight-spored ' structures can probably be best explained by reference to the chain-like emission in *Fucus spiralis*. Like the latter, *Ascoseira* is an intertidal form, although little is known of the effects of atmospheric conditions during the ebb in these regions.

Unfortunately the first material collected was lost in a shipwreck. Two drifted plants collected later on were fertile, but yielded little additional information. It must be hoped that any future collector finding fertile material will bear in mind the various problems raised by the origin, development and emission of these reproductive organs ; to discover their fate would imply facilities which may not be realized for many years.

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PSEUDANGIOSPERMY AND POLLINATION.

By MARY G. CALDER.

With recent developments of palaeobotanical research in relation to the history of seed plants, it has become increasingly evident that a variety of modifications for protection of ovules by partial or nearly complete enclosure by cupules, scales, or epimatia, has appeared during the course of evolution from the later Palaeozoic times onwards, in the Palaeozoic Pteridosperms, in the Caytoniales, the Corystospermaceae, the Bennettitales, the Cheirolepidaceae, and other groups. Indeed, it becomes apparent that the Mesozoic was in many respects an age of experiment in different types of enclosure of ovules. In none of these ‘ pseudangiospermous ’ groups, however, can one as yet discern the forerunner of the angiospermous carpel, by which complete enclosure of the ovules is effected, and on whose stigmatic surface the pollen germinates to produce the pollen tubes ; nor has one been able to say from direct evidence in which lines of descent the siphonogamic habit originated amongst seed plants. In the fossil groups, the nature of the pollination mechanisms, so important in any consideration of the morphology which effects enclosure or protection of the ovules, and in looking for our ‘ Protangiosperms ’ in the fossil record, has been unknown ; and indeed, only with the recent more intensive studies of Thomas [1] on the Corystospermaceae, of Thomas [2], and of Harris [3,4] on the Caytoniales, and of Florin [5,6] on the Palaeozoic Pteridosperms and on the Cordaitales, has more detailed knowledge of the nature of the pollen itself become available.

Together with these advances in our knowledge of modes of ovular protection and of pollen types in the fossils, there has been within the last few years a most significant addition to our knowledge of pollination mechanisms in living Coniferales, through the work of Doyle [7] and others of his school. Their results offer some very interesting analogies in considering pollination mechanisms in relation to types of pollen in fossil seed plants. In *Pinus*, which has previously been so much misunderstood in this connection, it now seems clear that in the air bladders or ‘ wings ’ of the pollen grain we have a flotation device (though other functions too may be involved), which serves to orientate the grain in the pollination drop in such a way that, when the grain is finally deposited on the nucellus, its germinal furrow on the distal face is closely apposed to the tip of the nucellus, and is there subject to its influence, so that the pollen tube grows directly in towards the embryo sac. Doyle’s review of the Pinaceae demonstrates effectively that this type of pollination mechanism is basal in this group, though various modifications are found ; the same type of mechanism appears in the Podocarpaceae, again in relation to the ‘ winging ’ of the grains and to the production of a pollination drop. The discovery by Florin of winged pollen grains in the late Palaeozoic Coniferalean types, *Lebachia* and *Ullmannia*, suggests that the neat, directive mechanism implied by the possession of the air bladders in some of the living Coniferales was present also in these very ancient types ; and his review of the pollen of the Cordaitales indicates that a similar mechanism probably operated in that group, in relation to a balloon-like air sac extending right over the proximal face of the grain.

In other groups of fossil seed plants, it is now of the greatest possible interest to note that some are characterized by the presence of winged pollen grains, no doubt similar to those of *Pinus*, and some by wingless grains, so far as our knowledge goes at present. In the Palaeozoic Pteridosperms and in the Mesozoic Bennettitales, we have groups in which the grains were wingless [5,8], and were no doubt caught in a pollination drop on an upright micropyle and drawn down into a nucellar pollen chamber, either by sinking in the fluid exudate, or by its retraction. The grains of these types are provided with germinal furrows in many cases, but there is no suggestion of any mechanism for the orientation of these furrows in relation to the nucellus ; it is indeed highly probable that motile sperms were produced by the pollen grain in the pollen chamber. If siphonogamy was developed, it must have been in relation to a random orientation of the furrows of the grains, with a correspondingly confused and crowded arrangement of the pollen tubes when they grew out, and with considerable uncertainty as to the successful transfer of the male gametes by way of the pollen tubes. On the other hand, in the Mesozoic Caytoniales and Corystospermaceae, the pollen grains are provided with two

' wings ' ; and when one considers these in relation to the placentation of the ovules, there is little doubt that they must have functioned, in respect of the pollination mechanism, as a flotation device serving to orientate the germinal furrow of the grain in such a way as to bring it into close proximity with the nucellus.

In none of these groups is there convincing direct evidence for the production of motile sperms or of pollen tubes functioning as sperm carriers. It can now, however, be a reasonable suggestion that in some of the early Coniferales, in the Cordaitales, and in the Caytoniales and the Corystospermaceae, the germinal furrow of the pollen grain was at the time of pollination subject to direct stimulation by the nucellar tip, in relation to which the successful protosiphonogamic habit no doubt arose ; and in these types, the most direct path for the pollen tube to reach the archegonium could also easily be followed.

The nature of the pollen may thus provide a valuable additional criterion of comparison in considering pollination mechanisms in fossil as in living types ; and the evidence from some of the living Pinaceae, such as the genus *Tsuga* [7], for the correlation of the reduction or loss of wings in the pollen grains with loss of the pollination drop and germination of the pollen grains independently of the nucellus, may yet provide an instructive analogy in interpreting possible Protangiospermous types amongst fossil seed plants.

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PROCEEDINGS OF THE GENERAL MEETING ON 23 January 1947

Mr. R. WINCKWORTH, M.A., Vice-President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 12 December 1946, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last Meeting :—Professor Sixten Bock, Miss H. Margaret Dymes, Capt. Eric Hardy, Dr. B. P. Uvarov, Professor F. E. Weiss, Carnegie Corporation of New York and the Institut des Parcs Nationaux du Congo Belge.

The following Fellows signed the Obligation in the Roll and Charter Book, and were Admitted Fellows :—Idris Valentine Hunt and John Dean Palmer.

The Vice-President in the Chair, reported the deaths of Frederick Harry Baker, Thomas Leonard Lancaster, Major William Herbert Mullens and the Rev. Alfred Thornley, Fellows of the Society ; Albert Bruce Jackson, Associate ; and Prof. Robert Almer Harper, Foreign Member.

Read for the first time certificates of recommendation of the following candidates for ordinary Associateship :—Charles Burford Goodhart, B.A., Miss Joan Griffiths, M.Sc., Frederick John Taylor, B.Sc., and Arnold Swaffer.

The following communications were read and discussed :—

Professor A. J. E. Cave. Original drawings of the Black and the White Rhinoceros, by W. J. Burchell. (Exhibit.) (Discussed by Dr. A. Tindell Hopwood and Prof. G. D. Hale Carpenter, M.B.E. ; Prof. Cave replied.) [This communication will be published in the next Part of the Proceedings.]

Major Gavin Maxwell. The Basking Shark (*Cetorhinus maximus*) of the Hebrides. (After Mr. W. G. Hartley had given an account of the morphology, the paper was discussed by Lt.-Col. W. P. C. Tenison, D.S.O., Prof. G. D. Hale Carpenter, M.B.E., Dr. Malcolm Smith and Dr. L. Richmond Wheeler ; Major Maxwell replied.)

An account of the habits and distribution of the Basking Shark : and of a shark-fishery in the Hebrides.

Dr. Hans Grüneberg. The significance of Coat Colour in Mammals. (Discussed by Prof. A. J. E. Cave, Dr. W. B. Turrill and Mr. H. R. Hewer ; Dr. Grüneberg replied.)

Adaptive fur colours in mammals can be explained by selection of genes on account of their effects on pigmentation itself. Some apparently non-adaptive coat colour differences between local races or subspecies are probably the result of the random fixation of genes (' genic drift ') which is a consequence of particulate inheritance in small breeding units. Certain trivial coat colour differences between subspecies which have no obvious adaptive significance again probably owe their existence to selection. But in this case the coat colour is only the ' label ' for more fundamental physiological processes which formed the real target for selective fixation. In such cases the coat colour difference is a mere by-product which can be tolerated so long as it is not seriously disadvantageous to survival.

The following papers were read in title :—

' New Tropical Fungi, II '. By C. G. Hansford, M.A., F.L.S., Dept. of Agriculture, Uganda. [Printed in full below.]

' Edmund Davall, F.L.S., an unwritten English chapter in the history of Swiss Botany '. By G. R. de Beer, F.R.S., Pres.L.S. [Printed in full, p. 42.]

' Synopses of the British Fauna.—No. 5. Freshwater Bivalves (Mollusca) Unionacea '. By A. E. Ellis, M.A., F.L.S.

NEW TROPICAL FUNGI.—II.

By C. G. Hansford, M.A., F.L.S., Dept. of Agriculture, Uganda.

(With 12 text-figures)

The first paper in this series appeared in *Proc. Linn. Soc. Lond.* 158, part 1, 1947.

The present paper deals with collections made by F. C. Deighton in Sierra Leone, by F. L. Hendrickx and R. L. Steyaert in the Belgian Congo, and by the writer in Uganda.

66. **Linotexis Deightonii,** sp. n.

Plagulae epiphyllae, late effusae confluentesque, velutinae atrae densae. *Mycelium* ex hyphis brunneis 5–6 μ crassis, subrectis vel leniter flexuosis (cellulis 15–20 μ longis), opposite vel irregulariter ramosis, dense reticulatis compositum. *Hyphopodia* continua, alternata vel unilateralia, subglobosa vel late cylindracea, apice rotundata, integra, circa 10 μ longa et 8–10 μ crassa. *Setae myceliales* numerosae, dense dispersae, opace atrae, erectae, plus minusve uncinatae, usque ad 120×6–7 μ, simplices, obtusae vel subacutae. *Perithecia* depresso-globosa, atra, 60–100 μ diam., 50–60 μ alt., glabra, haud setosa ; paries unistratosus ex cellulis angulosis 6 μ diam. et 4 μ cr. compositus, demum cellulis secedentibus et in muco ochraceo lento natentibus ; intra parietem ab basi perithecii hyphae meridianae 6–20 oriuntur, ascos includentes, dilute brunneae, simplices, apice obtusae vel subacutae, 3–4-septatae, usque ad 50×5 μ, sursum incurvatae. *Asci* 1–6, subsessiles, ovati, deorsum late nodoso-stipitati, apice late rotundatae haud incrassati, 8-spori, usque ad 60×40 μ. *Sporae* conglobatae, opace atrobrunneae, oblongae, utrinque rotundatae, 1-septatae, constrictae, cellulis subaequalibus vel superiore leniter crassiore, 23–27×13–14 μ ; episporio dense verrucoso.

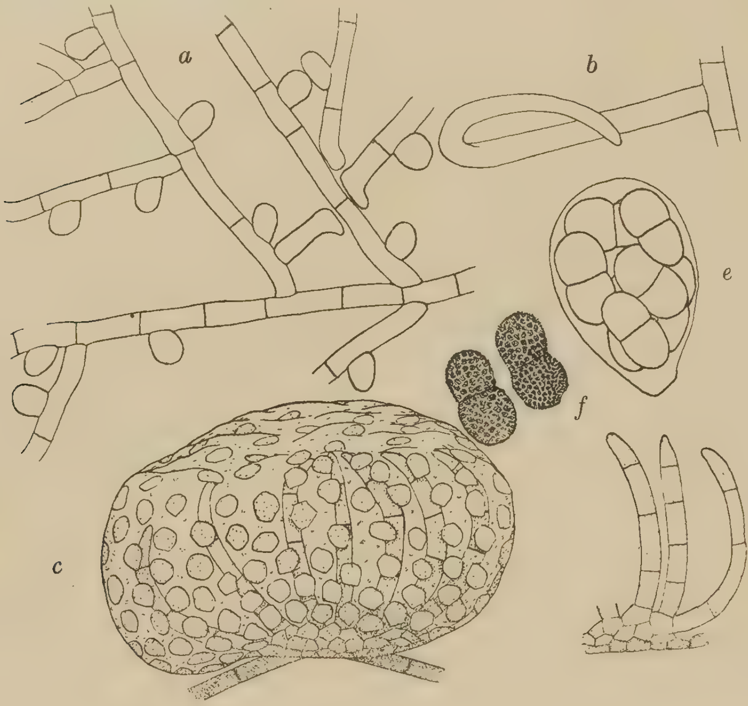

FIG. 1.—*Linotexis Deightonii* Hansford.
(*a*) Mycellium with hyphopodia ; (*b*) mycelial seta ; (*c*) perithecium showing wall and meridian hyphae ; (*d*) three meridian hyphae ; (*e*) ascus ; (*f*) two mature ascospores. ×1000.

Hab. in foliis *Salaciae senegalensis*, York, Sierra Leone, 14. 12. 1936, *F. C. Deighton M 1213 p.p.* (typus) ; Mano Bonjema, 15. 4. 1939, *Deighton M 2039 p.p.*

The perithecia begin as a terminal cell on a short erect 1-septate branch of the mycelium, and enlarge until they appear quite sessile. The wall is at first almost opaque black-brown and consists of angular parenchyma in a single layer ; later the wall cells separate and float singly on a layer of very tough yellow-brown gelatinous mucus formed inside the perithecium. From the base of the perithecium, inside the wall layer, a number of meridian hyphae develop from a light coloured layer of basal parenchyma ; these hyphae loosely enclose the few large asci (fig. 1).

67. **Irenina Securidacae,** sp. n.

Plagulae amphigenae, atrae, tenuissimae, aegre perspicues, effusae, orbiculares vel irregulares, leves, usque ad 5 mm. diam., saepe confluentes. *Mycelium* ex hyphis atrobrunneis, sinuosis vel flexuosis, 5–7 μ crassis (cellulis plerumque 25–30 μ longis), alternatim vel irregulariter (raro opposite) ramosis, laxe reticulatis compositum. *Hyphopodia capitata* alternata, antrorsa, plerumque recta, 14–19 μ longa, cellula basali cylindracea, 3–7 μ longa, cellula apicali subglobosa, saepe rotundato-angulosa, rarius sublobata, 9–14 × 8–13 μ. *Hyphopodia mucronata* plerumque hypophylla, in hyphis distinctis evoluta, alternata vel opposita, anguste ampullacea, subrecta, dilute brunnea, 18–22 × 5 μ, collo elongato 2·5 μ crasso. *Setae myceliales* nullae. *Perithecia* laxe dispersa, atra, globosa, usque ad 160 μ diam., cellulis multis in processibus conoideis vel corniformis, usque ad 40 μ alt. et basi 25 μ diam., saepe apice curvatis, obtusus productis. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 27–32 × 11–13 μ (30 × 12 μ).

Hab. in foliis *Securidacae Welwitschii*, Buhenda, Kivu, Congo Belge, *Hendrickx 3055.*

The perithecial outgrowths strongly resemble those of *Irene calostroma*, varying from mere conoid protuberances of the outer cell walls to elongate conoid protuberances of the outer cell walls to elongate conoid to ‘ larviform ’ appendages with obtuse bent apex, and then translucent dark brown and sometimes indistinctly transversely striate. Most of the surface cells show this development to some extent, and in this respect differ from most species of the genus *Irene*, in which comparatively few cells are produced into somewhat similar appendages, the remaining cells being either smooth or very shortly conoid. It is very difficult to decide in which of the two genera *Irene* and *Irenina* the present species is best placed.

68. **Meliola Agauriae,** sp. n.

Plagulae plerumque epiphyllae, raro etiam hypophyllae, atrae, velutinae, densissimae, subcrustosae, usque ad 4 mm. diam., dense dispersae. *Mycelium* ex hyphis atrobrunneis, flexuosis, 8–10 μ crassis (cellulis plerumque 30–50 μ longis), opposite vel irregulariter ramosis, dense reticulatis compositum, in centro plagularum subsolidum. *Hyphopodia capitata* alternata, plus minusve antrorsa, irregulariter curvata, 28–45 μ longa, cellula basali cylindracea, recta vel curvata, 4–20 μ longa, cellula apicali irregulariter lobata curvataque, 20–28 × 12–22 μ, versiformi. *Hyphopodia mucronata* rara, singulariter dispersa, ampullacea, curvata, 20–30 × 7–9 μ, collo brevi, curvato, 4–5 μ crasso. *Setae myceliales* numerosae, juxta perithecia aggregatae, etiam in mycelio dense stipatae, erectae, atrae, opacae, rectae, acutae, simplices, usque ad 400 × 9–11 μ. *Perithecia* dense dispersa, atra, globosa, usque ad 300 μ diam., crasse verrucosa, cellulis parietis obtuse conoideis. *Sporae* atrobrunneae, fusoideae, utrinque rotundatae, curvatae, 3–septatae, constrictae, cellulis centralibus majoribus, 61–71 × 22–25 μ (66 × 24 μ).

Hab. in foliis *Agauriae salicifoliae*, Mt. Kahuzi, Kivu, Congo Belge, *Hendrickx 3141 p.p.*

69. MELIOLA CAMPYLOTRICHA Syd. in Ann. Myc. **22**, 420, 1924.

On *Apodytes dimidiata*, Mt. Kahuzi, Kivu, Congo Belge, *Hendrickx 3142.*

Colonies amphigenous, mostly epiphyllous, black, orbicular, dense, velvety, up to 8 mm. diam. Mycelium of straight to slightly flexuous dark-brown hyphae 7–9 μ thick, cells mostly 30–40 μ long, branching usually opposite, at 30–90°, very closely reticulate. Capitate hyphopodia alternate, antrorse, usually more or less straight, 21–30 μ long, head cell subglobose to clavate, rarely entire, usually irregularly angulose or sub-3-lobed, 13–19 × 13–17 μ, stalk cell cylindric to cuneate, 7–13 μ long. Mucronate hyphopodia very few, none in some colonies, on separate hyphae, alternate or opposite, bent ampulliform, 20–25 × 9–12 μ, with elongate bent neck 4–5 μ thick. Mycelial setae very numerous, erect, opaque black, simple, obtuse to subacute, up to 300 × 9–12 μ, often thickest in the middle, irregularly flexuous to widely arcuate or very loosely spiral. Perithecia closely scattered, black, globose, verrucose, up to 280 μ diam. Spores dark brown, ellipsoid with rounded ends 3-septate constricted, the middle cells largest, 53–66 × 19–22 (61 × 21 μ).

70. **Meliola caseariicola,** sp. n.

Plagulae amphigenae, atrae, velutinae, orbiculares, usque ad 5 mm. diam., densae. *Mycelium* ex hyphis subrectis (in hypophyllo flexuosis, irregularibus), 8–9 μ crassis (cellulis plerumque 15–20 μ longis), opposite ramosis (60–90°), dense reticulatis compositum. *Hyphopodia capitata* alternata vel opposita, recta vel curvata, 17–25 μ longa, cellula basali cylindracea, plerumque antrorse curvata, 4–10 μ longa, cellula apicali cylindraceo-clavata, interdum subglobosa, apice rotundata vel subtruncata, 10–17 × 9–13 μ, integra. *Hyphopodia mucronata* modice numerosa, dispersa, opposita vel alternata, ampullacea, plus minusve curvata, 15–22 × 8–10 μ, collo curvato, 3–4 μ crasso. *Setae myceliales* numerosae, juxta perithecia aggregatae et in mycelio dense stipatae, erectae, rectae, simplices, acutae, atrae, usque ad 400 × 9–11 μ. *Perithecia* dispersa, atra, globosa, verrucosa, usque ad 180 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 46–52 × 17–20 μ (48 × 18·5 μ).

Hab. in foliis *Caseariae Engleri*, Entebbe, Uganda, *Hansford 3724 p.p.*

The opposite capitate hyphopodia are chiefly confined to those hyphae where mucronate hyphopodia occur mixed with the capitate.

71. **Irenina Eucleae,** sp. n.

Plagulae dispersae, epiphyllae, minutae, atrae, densae, leves, usque ad 1 mm. diam. *Mycelium* ex hyphis atrobrunneis, subrectis, 8–9 μ crassis (cellulis plerumque 15–25 μ longis), opposite ramosis (60–90°), dense reticulatis compositum. *Hyphopodia capitata* alternata vel 2–10% opposita, plus minusve antrorsa, recta, 18–30 μ longa, cellula basali cylindraceo-cuneata, 5–13 μ longa, cellula apicali clavata, recta vel subuncinata, 13–18 × 8–16 μ, integra vel rarius apice truncata vel sublobata. *Hyphopodia mucronata* dispersa, opposita vel alternata, conoidea vel ampullacea, plus minusve curvata, 18–27 × 7–9 μ, collo 3–4 μ crasso. *Setae myceliales* nullae. *Perithecia* dispersa, ex disco radiato solido orta ; matura non visa. *Sporae* atrobrunneae, subellipsoideae, utrinque rotundatae, 4-septatae, constrictae, 45–50 × 19–21 μ.

Hab. in foliis *Eucleae latidentis*, Beni-Katwe Road, prope Mt. Ruwenzori, Congo Belge, *Hendrickx 2745.*

Though fully mature perithecia were not found in this collection, those seen showed no sign of development of setae or other appendages, the surface cells being merely obtusely conoid.

72. **Meliola flacourtiacearum,** sp. n.

Plagulæ epiphyllæ, atræ, usque ad 3 mm. diam., densissimae, dense velutinae, subcrustosae. *Mycelium* ex hyphis atrobrunneis, subrectis vel leniter flexuosis, 8–10 μ crassis, (cellulis plerumque 15–20 μ longis), opposite subrectangulariter ramosis, dense reticulatis compositum, subsolidum. *Hyphopodia capitata* alternata, suberecta, recta vel leniter curvata, 21–35 μ longa, cellula basali cylindracea, 6–15 μ longa, cellula apicali clavato-cylindracea, recta vel leniter curvata, plerumque integra et apice late rotundata, raro subangulosa vel sublobata, 13–22 × 10–15 μ. *Hyphopodia mucronata* rara, dispersa, alternata, ampullacea, 20–28 × 7–9 μ, collo elongato, 3–4 μ crasso. *Setæ myceliales* numerosissimae, erectae, atrae, rectae, simplices, acutae, rigidae, 300–400 × 10–12 μ. *Perithecia* dispersa, atra, globosa, verrucosa, usque ad 250 μ diam. *Sporae* atrobrunneae, subfusoideae, utrinque rotundatae, 3-septatae, constrictae, 48–56 × 16–20 μ.

Hab. in foliis *Scolopiae rhamniphyllae*, Mt. Kashaka, Mufumbiru, Kivu, *Hendrickx 2731* (typus); Mbarara, Uganda, *J. D. Snowden* in *Herb. Bot.* Uganda.

73. **Meliola Hendrickxiana,** sp. n.

Plagulae amphigenae, plerumque epiphyllae, atrae, subdensae, orbiculares, usque ad 7 mm. diam. vel confluentes, tenuiter vel subdense velutinae. *Mycelium* ex hyphis atrobrunneis, undulatis vel flexuosis, 6–8 μ crassis, (cellulis plerumque 30–40 μ longis) opposite vel irregulariter ramosis, dense reticulatis compositum. *Hyphopodia capitata* alternata, plus minusve curvata, 20–34 μ longa, cellula basali cuneata vel cylindracea, plus minusve curvata, 6–17 μ longa, cellula apicali interdum anguste ovata, plerumque irregulariter angulosa vel sub-2–3-lobata, versiformi, saepe curvata, 13–20 × 9–15 μ. *Hyphopodia mucronata* in hyphis distinctis evoluta, numerosa, opposita, alternata vel ternata, breviter ampullacea, 13–18 × 7–9 μ, collo brevi subrecto, 3 μ crasso. *Setae myceliales* numerosae, juxta perithecia aggregatae et in mycelio dense stipatae, erectae, atrae, simplices, rectae, acutae vel subacutae, 250–400 × 8–9 μ. *Perithecia* dispersa, atra, globosa, verrucosa, usque ad 200 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 37–44 × 13–15 μ (41 × 14 μ).

Hab. in foliis Papilionacearum sp. indet. (? *Vigna* spec.) Busanganya, Kivu, Congo Belge, *Hendrickx 3007*.

74. MELIOLA IMPATIENTIS Doidge, **var. densa,** var. n.

Plagulae amphigenae, plerumque epiphyllae, laxe dispersae, atrae, orbiculares, 0·5–2 mm. diam., densae, crustosae, velutinae. *Mycelium* ex hyphis atrobrunneis, undulatis vel flexuosis, 8–10 μ crassis, (cellulis plerumque 15–25 μ longis), alternatim vel irregulariter ramosis, dense reticulatis compositum, subsolidum. *Hyphopodia capitata* alternata vel unilateralia, 17–23 μ longa, cellula basali cylindracea, 3–7 μ longa, cellula apicali subglobosa, irregulariter angulosa vel raro sublobata, 12–18 × 13–18 μ. *Hyphopodia mucronata* subinde numerosa, subinde rara, in hyphis distinctis evoluta, opposita vel alternata, ampullacea vel conoidea, plus minusve curvata, 16–20 × 8–10 μ, collo 3 μ crasso. *Setae myceliales* numerosae, dense dispersae, erectae, opace atrae, rectae, simplices, subacutae vel obtusae, usque ad 400 × 10–12 μ. *Perithecia* in centro plagularum dense aggregata, atra, globosa, verrucosa, usque ad 230 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 39–47 × 15–18 μ (44 × 16 μ).

Hab. in foliis *Impatientis* sp., Mt. Kahuzi, Kivu, Congo Belge, *Hendrickx 3191*.

75. **Meliola Irvingiae,** sp. n.

Plagulae amphigenae, laxe dispersae, atrae, orbiculares, usque ad 10 mm. diam., densae, dense velutinae. *Mycelium* ex hyphis subrectis vel undulatis, atrobrunneis, 7–9 μ crassis, (cellulis plerumque 15–30 μ longis), opposite vel irregulariter ramosis (45–60°), dense reticulatis compositum, in centro subsolidum. *Hyphopodia capitata* alternata, plus minusve antrorsa, saepe curvata, 19–33 μ longa, cellula basali cylindracea, recta vel curvata, 5–12 μ longa, cellula apicali versiformi, cylindraceo-clavata, oblonga, angulosa vel irregulariter sublobata, plus minusve curvata, 13–21 × 10–16 μ. *Hyphopodia mucronata* pauca, dispersa, opposita vel alternata, ampullacea, curvata, 17–21 × 8–10 μ, collo 3 μ crasso. *Setae myceliales* numerosissimae, erectae, atrae, opacae, simplices, subacutae vel obtusae, usque ad 330 × 8–10 μ, sursum late arcuato-uncinatae vel laxe spiraliter curvatae. *Perithecia* dispersa, atra, globosa, verrucosa, usque ad 220 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 43–52 × 17–21 μ (47 × 18·5 μ).

Hab. in foliis *Irvingiae wombolu*, Stanleyville, Congo Belge, *R. L. Steyaert 45004.*

76. **Meliola myricicola,** sp. n.

Plagulae epiphyllae, atrae, orbiculares, densae, 0·5–2 mm. diam., dense stipatae et subconfluentes. *Mycelium* ex hyphis atrobrunneis, undulatis, 8–10 μ crassis, (cellulis plerumque 15–25 μ longis), opposite vel irregulariter ramosis dense reticularis compositum. *Hyphopodia capitata* alternata, 18–25 μ longa, antrorsa, plerumque subrecta, cellula basali cuneata, 4–9 μ longa, cellula apicali subglobosa vel leniter angulosa, 12–17 × 12–15 μ. *Hyphopodia mucronata* modic-enumerosa, in hyphis distinctis evoluta, opposita vel alternata, ampullacea, plus minusve curvata, 13–21 × 8–10 μ, collo 4 μ crasso. *Setae myceliales* dispersae, atrae, opacae, rectae, simplices, subacutae, usque ad 280 × 8–10 μ. *Perithecia* in centro plagularum dense aggregata, atra, globosa, verrucosa, usque ad 160 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae 48–55 × 16–18 μ (51 × 17 μ).

Hab. in foliis *Myricae* sp., Kakondo, Kivu, Congo Belge, *Hendrickx 2866.*

77. **Meliola peddiicola,** sp. n.

Plagulae amphigenae, plerumque epiphyllae, atrae, orbiculares, densae, dispersae, usque ad 1 mm. diam. *Mycelium* ex hyphis atrobrunneis, subrectis, 7–8 μ crassis, (cellulis plerumque 15–20 μ longis), opposite ramosis (60–90°), dense reticulatis compositum. *Hyphopodia capitata* alternata vel usque ad 20 % opposita, leniter antrorsa, plerumque recta, 14–20 μ longa, cellula basali cylindracea, 2–6 μ longa, cellula apicali ovata vel cylindracea, apice late rotundata, integra, 10–15 × 8–11 μ. *Hyphopodia mucronata* modice numerosa, dispersa, opposita vel alternata, ampullacea, plus minusve curvata, 13–20 × 8–10 μ, collo brevi, 3 μ crasso. *Setae myceliales* juxta perithecia aggregatae et in mycelio lâxe dispersae, erectae, atrae, rectae, usque ad 400 × 7–9 μ, raro simplices, acutae, plerumque 2-dentatae (–10 μ), eae juxta perithecia breviores, dentatiores. *Perithecia* in centro plagularum laxe aggregata, atra, globosa, verrucosa, usque ad 160 μ diam. *Sporae* atrobrunneae, cylindraceae, utrinque rotundatae, 4–septatae, constrictae, 34–42 × 14–17 μ (38 × 15·5 μ).

Hab. in foliis *Peddiaeae Fischeri*, Entebbe, Uganda *Hansford 3705* (typus) ; Sesse Is., Lake Victoria, *Hansford 3704, leg. J. Purseglove.*

Hypophyllous colonies are thinner and larger, with scattered perithecia and more flexuous mycelium.

78. MELIOLA PLANTAGINIS Hansf. & Stevens in Journ. Linn. Soc. **51,** p. 280, 1937.

On *Plantago palmata*, Kibatama, Mamve, Kivu, Congo Belge, *Hendrickx 3274.*

This is the only collection made since the type was found on Mt. Elgon, Uganda.

79. **Meliola yangambiensis,** sp. n.

Plagulae amphigenae, plerumque epiphyllae, usque ad 5 mm. diam., atrae, densae, velutinae, plerumque discretae. *Mycelium* ex hyphis atrobrunneis, rectis, 10–12 μ crassis, opposite ramosis (45–60°), dense reticulatis compositum. *Hyphopodia capitata* alternata, recta, antrorsa, 28–37 μ longa, cellula basali cylindracea 8–13 μ longa, cellula apicali cylindracea vel leniter clavata, apice rotundata, integra, 20–26 × 12–16 μ. *Hyphopodia mucronata* paucissima, dispersa, opposita vel alternata, ampullacea, plus minusve curvata, 22–28 × 10–13 μ, collo 3–4 μ crasso. *Setae myceliales* numerosae, dense dispersae, erectae, opacae, atrae, simplices, obtusae, 250–400 × 10–12, late hamatae vel uncinatae. *Perithecia* dispersa, atra, globosa, verrucosa, usque ad 240 μ diam. *Sporae* atrobrunneae, cylindraceae vel ellipsoideae, utrinque rotundatae, 4-septatae, constrictae, 50–61 × 22–27 μ.

Hab. in foliis *Fagarae Laurentii*, Yangambi, Congo Belge, *Hendrickx 3018.*

80. **Euryachora Syzygii** (Rac.), comb. n.

Syn. *Lizonia Syzygii* Rac. in Bull. Acad. Sci. Cracovie, p. 387, 1909.
Lizoniella Syzygii (Rac.) Sacc. & Trott, Sylloge Fungorum, **22**, p. 166, 1913.

On *Syzygium* sp., Lwamisole, Kivu, Congo Belge, *Hendrickx 3033.*

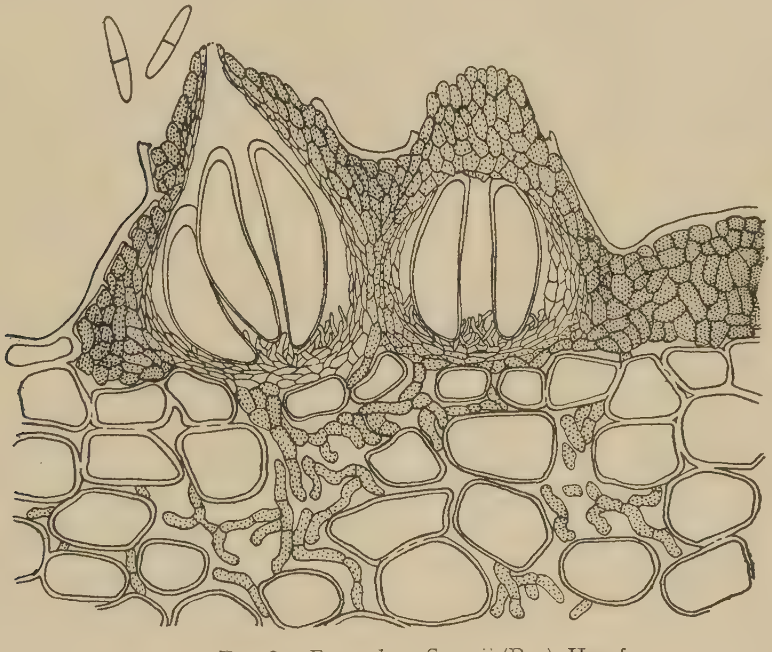

FIG. 2.—*Euryachora Syzygii* (Rac). Hansf.
Section showing internal mycelium, epidermal stroma, and two perithecia ; and two free ascospores. × 1000.

The fungus causes dark angular violet-black spots on the lower surface of the leaf, which with the development of the perithecia become roughened black. The mycelium penetrates almost the whole thickness of the leaf mesophyll as loose olivaceous hyphae 3–4 μ thick, shortly septate, ramifying through the intercellular spaces, not forming haustoria and not penetrating the cells. Beneath the epidermis the mycelium aggregates to form a black layer which fills the epidermal cells to form almost a continuous clypeus over the whole

area of the leafspot, 10–30 μ thick. The perithecia develop towards the inner surface of this clypeus, and as they expand the cuticle of the leaf becomes ruptured, and the apex of the loculus protrudes through it. The loculi are single, always discrete, at first globose, later ampulliform as the apical beak develops, lined with one or two layers of much compressed hyaline angular cells about 6 μ diam., the outer wall being continuous with the tissue of the surrounding stroma ; loculi 60–80 μ diam., up to 100 μ high, with a minute apical pore. Asci few, basal, aparaphysate, ellipsoid to saccate, sessile, 8-spored, thin-walled, straight or more often bent, up to 60 × 15 μ. Spores multiseriate, hyaline, cylindric-fusoid with rounded ends, smooth, 1-septate in the middle, not constricted, 23–30 × 3·5–5 μ, straight or slightly bent. The loculi are often closely crowded, but never confluent, and the development of the epidermal stroma with the immersed perithecia resembles to some extent that of *Phyllachora*, though in the present species the perithecia occupy much less of the thickness of the leaf than is typical in species of that genus, where the immersed perithecia remain covered by the unbroken cuticle and the epidermal clypeus. On the other hand the present fungus cannot be retained in Sphaeriaceae, which is characterized by completely superficial perithecia, and in view of the similarities with *Phyllachora*, it has seemed best to transfer it to Phyllachoraceae as *Euryachora Syzygii* (Rac.), comb. n. (Fig. 2.)

81. **Phanerococcus Rapaneae,** sp. n.

Perithecia hypophylla, superficialia, dense stipata, minuta, atra, globosa, singula vel plerumque 2–3-aggregata, in stromatibus minutis, superficialibus sessilia ; stromata ex hyphis mycelii composita. *Mycelium* in stomatibus penetrans et in cellulis paucis sub stomatibus nodum subhyalinum pseudoparenchymaticum efformans, profundius in folium haud penetrans ; mycelium superficiale vicinia peritheciorum circumscriptum. *Perithecia* sessilia, globosa, levia, glabra, atra, 100–120 μ diam., in sicco depressa, dura, fragilia ; paries subopace atrobrunneus, parenchymaticus, 1–2-stratosus, poro apicali minuto pertusus. *Asci* basales, numerosi, ovati, deorsum breviter nodoso-stipitati, aparaphysati, sursum late rotundati, incrassati (–6 μ), 8-spori, usque ad 65 × 45 μ, in ordine maturescentes. *Sporae* multiseriatae, hyalinae, fusoideae, utrinque rotundatae, saepe curvulae, 3-septatae, in medio leniter constrictae, leves, 28–35 × 8–10 μ.

Pycnidia peritheciis consimilia ; pycnosporae hyalinae, fusoideae, utrinque rotundatae, 3-septatae, haud constrictae, 35–40 × 5–6 μ, curvatae, leves.

Hab. in foliis *Rapaneae* sp., Kabushwa, Kivu, Congo Belge, *Hendrickx 3209*.

The perithecia are formed singly or in small groups on closely scattered minute stromatic aggregations of the surface mycelium, which is exhyphopodiate, subhyaline to pale brown, 2–3 μ thick, irregularly branched and loosely reticulate, limited to the close vicinity of the stromata. Some hyphae penetrate the stomata of the host and form small knots of pseudoparenchyma in a few cells immediately below each stoma, not penetrating further into the mesophyll. The pycnidia are formed on the same stromata as the perithecia, and are mixed with the latter. The pycnospores resemble very closely the conidia of the *Martiella* group of *Fusarium* species. No leafspots are caused by this fungus.

82. **Didymella muhavurensis,** sp. n.

Perithecia epiphylla, dense singulariterque dispersa, atra, globosa, immersa, glabra, punctiformia, circa 150 μ diam., raro 2-connata, haud prominentia, apice poro rotundato, 15 μ diam., pertusa. *Paries* multi-stratosus, parenchymaticus, atrobrunneus, lentus, membranaceus, 10–20 μ crassus, intus hyalinus. *Asci* numerosi, basales, fasciculati, cylindraceo-ellipsoidei, apice rotundati, subsessiles, tenuiter tunicati, 8-spori, plus minusve curvati, 50–60 × 10–15 μ. *Sporae*

2-seriatae, hyalinae, clavulato-ellipsoideae, utrinque rotundatae, leves, 1-septatae haud vel lenissime constrictae, 18–20×5–6 μ, cellula superiore saepe lenissime crassiore. *Paraphyses* numerosae, filiformes, plus minusve evanescentes.

Hab. in foliis *Hyperici lanceolati*, Mt. Muhavura, Kigezi, Uganda, *Hendrickx 2677*.

The perithecia are closely and singly scattered over large parts of the upper surface of the leaves, completely immersed and appearing as minute black dots ; the slightly convex ostioles do not protrude from the leaf.

83. **Phyllachora Hendrickxii,** sp. n.

Maculae rotundatae vel irregulares, 1–4 mm. diam., dense dispersae, acute limitatae, siccae, stramineae vel albidae, haud secedentes, in hypophyllo zono indistincto discolorato circumdatae. *Stromata* in centro macularum dense 1–4-aggregata vel plus minusve connata, atra, convexa, nitentia, levia, poris peritheciorum pertusa. *Clypeus* epidermalis, ex cellulis opacis, atris, 4–5 μ diam., compositus, cum ostiolis peritheciorum connatus, 15–20 μ crassus ; in hypophyllo plus minusve indistinctus. *Perithecia* omnino immersa, globosa vel depresso-globosa, crassitudinem totam folii occupantia, usque ad 240 μ diam. et ad 170 μ alt. ; paries pluristratosus, parenchymaticus, circa 20 μ cr., brunneus, concentrice fibrosus, intus hyalinus, apice poro rotundato 20 μ diam. pertusus, inferne dilutior, tenuior. *Asci* numerosi, aparaphysati, cylindraceo-clavati, apice rotundati, deorsum in stipitem brevem attenuati, tenuiter tunicati, 8-spori, usque ad 80×18 μ. *Sporae* oblique 1–2-seriatae, ellipsoideae, utrinque rotundatae, hyalinae, leves, continuae, 14–17×6–7 μ, intus refringentes et saepe spurie 1-septatae.

Hab. in foliis *Acanthacearum* sp. indet., Mt. Tschaberimu, Kivu, *Hendrickx 2639*.

84. **Phaeodothis Hendrickxii,** sp. n.

Stromata epiphylla, in maculis flavidis, indistinctis, usque ad 15 mm. diam., laxe irregulariterque dispersa, atra, convexa, levia, nitentia, 0·8–1·5 mm. diam., interdum 2–3-connata, usque ad 200 μ alta, in hypophyllo haud perspicua. *Clypeus* epidermidem et subepidermidem folii includens, ex cellulis opacis, atris, 4 μ diam. compositus, cuticula folii intacta velatus, usque ad 30 μ crassus, acute limitatus. *Perithecia* subepidermalia, dense stipata, globosa vel depressa, usque ad 240 μ diam., et 120–150 μ alt. ; paries pluristratosus, dilute brunneus, ex cellulis angulosis compositus, intus hyalinus, totus 20–30 μ crassus, apice poro rotundato 20 μ diam. pertusus. *Asci* numerosi, erecti, in ordine maturescentes, cylindraceo-clavati, apice rotundati, deorsum in stipitem brevem attenuati, 8-spori, tenuiter tunicati, saepe curvati, 80–110×12–16 μ. *Sporae* plus minusve oblique 2-seriatae, clavulato-ellipsoideae, utrinque rotundatae, brunneae, leves, 1-septatae, interdum leniter constrictae, 18–21×7–8 μ, cellula superiore leniter crassiore. *Paraphyses* primo numerosae, hyalinae, filiformes, indistincte ramosae, septatae, demum evanescentes.

Hab. in foliis *Senecionis Mariettae*, Mt. Visoke, Kivu, *Hendrickx 2685*.

The stromata are all epiphyllous, scattered loosely and irregularly on indefinite yellowish leafspots up to 15 mm. diam., rather irregular in shape, black convex, smooth shining, sometimes 2–3-connate and irregular, projecting up to 200 μ above the leaf surface and easily detached more or less complete, not visible from the lower surface of the leaf. The stroma consists of little more than the closely adjacent perithecia covered by a common clypeus of opaque black parenchyma filling the epidermis and subepidermis of the host leaf. Around the sharp edge of the clypeus there is a mycelium of hyaline subcuticular hyphae, in places extending downwards between the unchanged epidermal cells, but not reaching the subepidermis. Beneath the perithecia the palisade

layer of the leaf is turned brown and a few hyphae penetrate between the cells, but do not extend further into the leaf. The perithecial loculi are at first filled completely with a loose tissue of hyaline septate, indistinctly branched paraphyses, passing gradually into the parenchyma of the inner layers of the perithecial wall, and disappearing as the asci develop. The perithecial wall is coalescent with the clypeus around the apex, but lower down becomes quite distinct. (Fig. 3.)

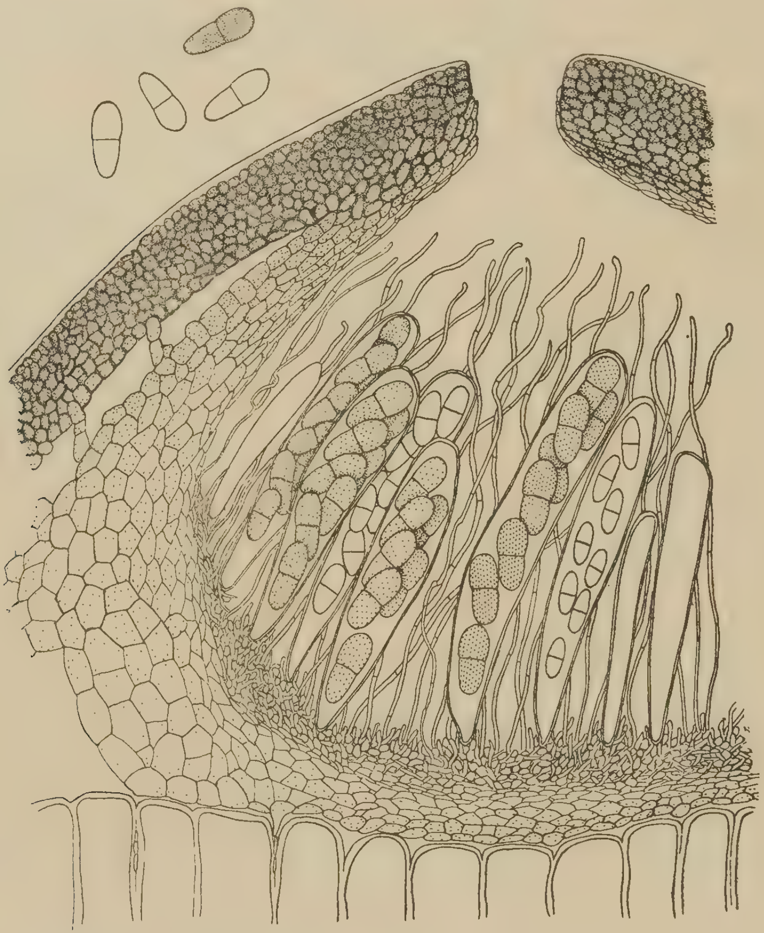

Fig. 3.—*Phaeodothis Hendrickxii* Hansf.
Section of stroma showing part of clypeus and of one perithecium ; and four ascospores. × 1000.

85. **Phaeodothis Rapaneae,** sp. n.

Stromata hypophylla, laxe dispersa, atra, leniter convexa, rotundata, 1–2 mm. diam., levia, nitentia. *Clypeus* epidermalis, ex cellulis opacis, atris compositus. *Perithecia* dense stipata, globosa, 120–140 μ diam. ; paries 2–4-stratosus, hyalinus, parenchymaticus, apice poro rotundato pertusus. *Asci* basales, aparaphysati, ellipsoidei, subsessiles vel brevissime nodoso-stipitati, sursum rotundati, incrassati (–10 μ), 8-spori, usque ad 70×25 μ.

Sporae longitudinaliter pluriseriatae, cylindraceae, utrinque rotundatae, rectae vel curvatae, 1-septatae, haud constrictae, leves, postremo dilute olivaceae, 25–28 × 4–5 μ.

Hab. in foliis *Rapaneae* sp., Mt. Kahuzi, Kivu, Congo Belge, *Hendrickx 3143.*

The clypeus extends over the whole stroma, filling the epidermis with dark brown small parenchyma and extending deeper into the mesophyll as a loose tissue of hyaline to pale-olivaceous septate intercellular hyphae, causing hypertrophy of the tissues of the lower half of the leaf. The perithecia are closely scattered in the stroma in a single layer beneath the clypeus, and in the upper half the perithecial wall is connate with the clypeus, but lower down is distinct as a thin wall of 2–4 layers of hyaline flattened parenchyma.

86. **PHRAGMODISCUS**, gen. nov. Xylariacearum.

Stromata discoidea, atra, rotundata, spongiosa, medifixa, sessilia, caulicola. *Perithecia* immersa, unistratosa, ampullacea, dense stipata, ostiolis prominulis. *Sporae* hyalinae, fusoideae, transverse multiseptatae.

Phragmodiscus Arundinariae, sp. n.

Stromata caulicola, sessilia, virideo-nigra, discoidea, molliter spongiosa, usque ad 6 cm. diam. et ad 1 cm. crassa, marginem versus tenuiora, medio basi affixa ; ex hyphis atrobrunneis, laxis, plus minusve erecto-parallelis, rectis vel flexuosis, parce ramosis, 5–7 μ crassis, septatis (cellulis circa 20 μ longis) composita, superficie laxe velutina, basi levia, plus minusve nitentia. *Perithecia* unistratosa, immersa, ostiolis prominulis, dense stipata, discreta, ampullacea, ostiolo elongato, ventre globoso 250–550 μ diam., collo usque ad 800 μ longo et circa 250 μ diam., extus hyphis brevibus eis stromatis consimilibus vestita ; paries lentus, alutaceus, membranaceus, deorsum circa 30 μ crassus, ex cellulis subopace atrobrunneis, 10–20 × 5–8 μ compositus, pluristratosus, intus subhyalinus ; paries colli durior, 80–100 μ crassus. Loculus plus minusve globosus, usque ad 500 μ diam., dimidio inferiore ascogeno. *Asci* numerosissimi, cylindracei, apice rotundati, deorsum in stipitem attenuati, tenuiter tunicati, 8-spori, 200–250 × 18–24 μ, saepe per ostiolum extrusi. *Sporae* imbricatae, 2-seriatae, cylindraceo-fusoideae, utrinque rotundatae, hyalinae, leniter curvatae, leves, 55–70 × 7–8 μ, 5(–7–9)-septatae, haud constrictae.

Hab. in caulibus *Arundinariae alpinae*, Mt. Elgon, Uganda, Hansford 1205 (typus) ; Mt. Tschaberimu, Kivu, *Hendrickx 2724.*

This fungus is very common on the mountains of East and Central Africa, wherever the host occurs in quantity, and is definitely parasitic, causing a slow rotting of the individual sections of the stem attacked. The whole stroma is of a very soft and spongy texture, but rather retentive of liquid water and requiring a long time to dry out thoroughly for preservation. When quite fresh the stromata appear as greenish black somewhat hairy discs scattered up the stem of the bamboo, usually not more than one on any single section of the stem, and closely attached over a small central area of the flat, rather denser, smooth shining base. When detached from the host, a small round aperture is often left in the host stem, and internally this is surrounded by a grey area indicating the presence of the dark hyphae of the mycelium, which appears usually to be limited to a single section of the host stem. The tissue of the stroma consists of erect dark brown little branched hyphae, loosely intertwined, and covering almost completely the numerous perithecia, save for their slightly protruding ostioles. The perithecia are flask-shaped, tough leathery membranous in texture, black, closely scattered but always separate, covered on the surface with hyphae like those of the stroma tissue but shorter, each having a single loculus which bears asci over the whole of its lower half or even the lower two-thirds of the internal surface, mixed with numerous filiform hyaline, indistinctly septate paraphyses, up to 350 × 1 μ. The asci are very numerous, cylindric with a rather long narrow stipe, thin-walled, 8-spored. The spores are imbricately 2-seriate, cylindric-fusoid, hyaline, slightly curved, with rounded ends, smooth, 55–70 × 7–8 μ, transversely 5–9-septate, not constricted, much resembling the conidia of a *Fusarium* species. Spores found loose on the surface of the stroma are often pale olivaceous and 7–9-septate, but those in the asci are rarely more than 5-septate and always hyaline. As the asci mature they are often extruded in large numbers through the ostiole, still containing their 8 spores.

87. **Limacinia Hendrickxii,** sp. n.

Mycelium ex hyphis superficialibus, exhyphopodiatis, olivaceis, 3–8 μ crassis, (cellulis 5–12 μ longis), irregulariter denseque ramosis, dense intertextis et pelliculam usque ad 30 μ cr. efformantibus compositum. *Conidia* non visa. *Perithecia* dense dispersa, superficialia, atra, sessilia vel breviter lateque stipitata, (–40 μ alt.), globosa, 100–160 μ diam.; paries 1–2-stratosus, subopace virideo-niger, parenchymaticus, cellulis angulosis 5–8 μ diam., intus hyalinus, totus 7–10 μ crassus, subdurus, fragile membranaceus; extus levis vel inferne in hyphis mycelii transiens. *Setae peritheciales* ex parte superiore ortae, 10–25, erecto-patentes, opacae, rectae, acutae, usque ad 30 μ longae, et basi 5–7 μ crassae. *Asci* numerosi, basales, aparaphysati, ellipsoidei, tenuiter tunicati, sessiles, apice rotundati, 8-spori, usque ad 45 × 12 μ. *Sporae* 2-seriatae, ellipsoideae vel leniter clavatae, brunneae, leves, 3-septatae, haud constrictae, utrinque rotundatae, 13–17 × 4–6 μ.

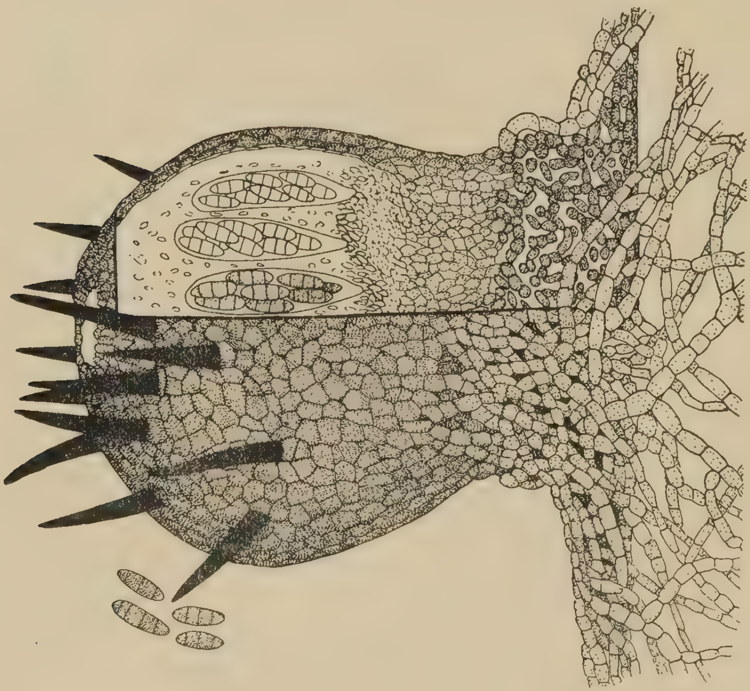

FIG. 4.—*Limacinia Hendrickxii* Hansf.
Showing part of the mycelium, one perithecium, perithecial setae, asci and four free ascospores. × 1000.

Hab. in foliis *Tecleae* sp. (?), socio insectorum, Ruambira, Kivu, *Hendrickx 2620.*

The mycelium is entirely superficial and apparently saprophytic on the exudations of the associated coccids ; it forms an effuse black layer, up to 30 μ thick towards the centre, covering most of the leaf, and composed of exhyphopodiate dark hyphae 3–8 μ thick, the wider hyphae somewhat constricted at the septa, closely interwoven and forming a solid mass in the centre, which when dry becomes very brittle and easily secedent. No conidia were found. The perithecia are densely scattered over the centre of the colony, sessile or supported by a short (–40 μ) wide spongy stipe of aggregated hyphae, black, globose, with an indistinct apical pore, surrounded by scattered erect opaque black straight rigid acute setae. In the lower part the wall of the perithecium passes into the mycelial hyphae, but becomes parenchymatous above ; the inner layer is hyaline and consists of small much flattened angular parenchyma. (Fig. 4.)

88. **Entopeltis ruwenzoriensis,** sp. n.

Coloniae epiphyllae, griseae, leves, nitentes, usque ad 2 mm. diam. *Mycelium* omnino subcuticulare, ex hyphis dilute olivaceis vel subhyalinis, 6–10 μ crassis, (cellulis plerumque 5–10 μ longis), haud constrictis, irregulariter denseque ramosis compositum, septis hypharum atrobrunneis ; haustoria nulla. *Ascomata* dense stipata, discreta vel interdum 2-connata, depresso-conica, atra, levia, nitentia, subcuticularia, 100–160 μ diam., et usque ad 50 μ alt. *Paries superior* ex cellulis opace atris, 5–8 μ diam., subradiatim stipatis compositus, unistratosus, apice poro rotundato, 10–15 μ diam. pertusus. *Paries inferior* dilute olivaceus vel subhyalinus, tenuis, parenchymaticus, inferne ad cellulas epidermidis folii arcte adnatus, intus in stratum tenue cellularum hyalinarum transiens, in centro in columnam parenchymaticam, hyalinam, parietem superiorem attingentem transiens, postremo columna evanescenti. *Asci* centripetales, versus porum apicalem directi, aparaphysati, ellipsoidei, sessiles vel brevissime nodoso-stipitati, apice rotundati, tenuiter tunicati, 8-spori 40×10–15 μ. *Sporae* 2–3-seriatae, ellipsoideo-clavulatae, continuae, utrinque rotundatae, deorsum plus minusve attenuatae, brunneae, prope apicem zono hyalino, transverso praeditae, 12–15×5–6 μ, leves.

Hab. in foliis *Fici* sp. indet., Mutuanga, Ruwenzori, Congo Belge, *Hendrickx 2717.*

The young ascomata contain a central sterile column of hyaline parenchyma, continuous with the basal wall of the ascoma, disappearing in mature ascomata to make room for the centripetally directed asci. The subcuticular mycelium does not form haustoria in the underlying epidermal cells, and there is no further penetration of the host ; in the centre of the colony the mycelium forms almost a solid plate, which later becomes converted into the upper wall of the ascomata.

89. **Stigmatea Hendrickxii,** sp. n.

Ascomata epiphylla, dense aggregata, (greges usque ad 2 mm. diam.) atra, hemisphaerica, convexa, usque ad 160 μ diam., et ad 120 μ alt., omnino subcuticularia, poro centrali rotundato praedita, levia, nitentia. *Paries superior* unistratosus, parenchymaticus, indistincte radiatus, opace ater, ex cellulis 5–8 μ diam. compositus, circa 5 μ crassus, sursum cuticula folii arcte adnatus, intus strato hyalino e cellulis fortissime compressis composito velatus. *Paries inferior* atrobrunneus, meandrice plectenchymaticus, unistratosus. *Basis loculi* cellulis hyalinis, fibrosis impleta. *Asci* basales, aparaphysati, saccato-ellipsoidei, breviter nodoso-stipitati, apice late rotundati, incrassati (–10 μ), 4–8-spori, 60–100×25–30 μ. *Sporae* 2-seriatae vel subparallelae, cylindraceae vel subclavulatae, utrinque rotundatae, 1-septatae, leniter constrictae, brunneae,

leves, rectae vel curvulae, cellula superiore saepe leniter crassiore, 35–40 × 11–13 μ.

Hab. in foliis *Rubiacearum* sp. indet., Mt. Tschaberimu, Kivu, *Hendrickx 2700*.

The mycelium is hyaline and forms a loose network beneath the cuticle, following the edges of the cells of the epidermis and passing between these as narrow plates of small cells to join up below to form a very thin subepidermal plate of hyaline parenchyma. Similar plates of parenchyma penetrate between the upper parts of the palisade layer, but do not extend to the base of this layer. The ascomata are hemispheric, smooth, shining, black, each with a central pore, with the opaque wall connate with the unbroken cuticle and consisting of an outer indistinctly radiate dark layer of cells lined internally by an extremely thin, often scarcely visible layer of compressed hyaline parenchyma. The basal wall is closely adnate to the epidermal cells beneath, and consists of meandering dark brown cells in a single layer; internally there is a loose tissue of small fibrous hyaline parenchyma filling the lower part of the loculus, and from which the asci arise. The spores are at first ellipsoid to cylindric, 2-several-seriate, long remaining hyaline and continuous, but finally uniformly brown, 1-septate, slightly constricted and smooth. (Fig. 5.)

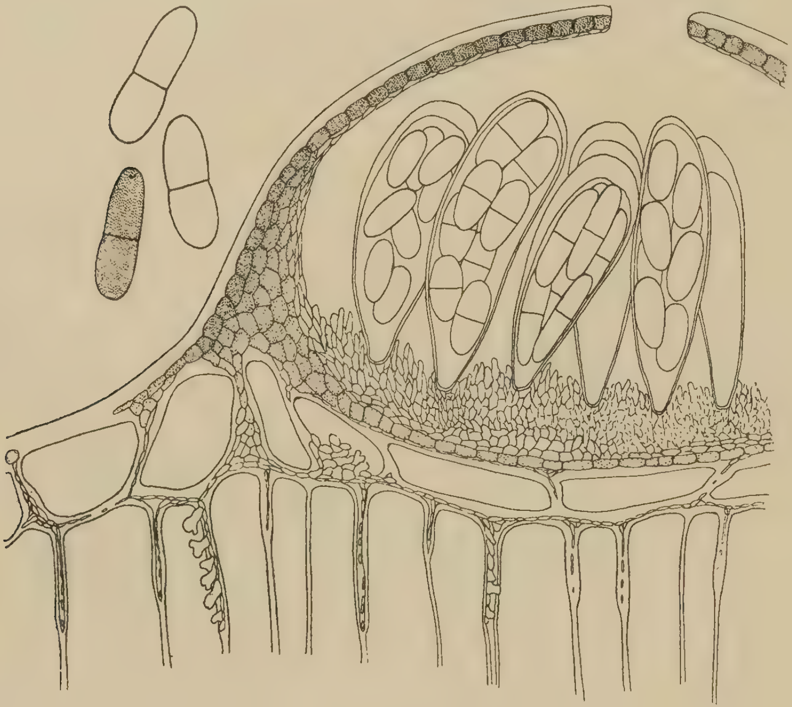

FIG. 5.—*Stigmatea Hendrickxii* Hansf.
Section through part of one ascoma, and three ascospores. × 1000.

90. **Hysterostomella Gymnosporiae,** sp. n.

Stromata epiphylla, laxe dispersa, usque ad 1 mm. diam. et ad 200 μ alt., irregulariter discoideo-pulvinata, atra, rugosa, dura carbonacea. *Mycelium* in strata superiora mesophylli penetrans, hyphis hyalinis, septatis, intercellularibus, sub stromate superficiali stratum hyalinum, tenue, continuum, subepidermale

efformantibus, passim inter cellulis epidermidis massas parenchymaticas efformantibus et per cuticulam folii ad stroma superficiale directe connexis; mycelium superficiale nullum. *Paries inferior* ascostromatis cuticulam folii arcte adnatus, parenchymaticus, brunneus, intus in stratum fibrosum, hyalinum transiens. *Paries superior* opace atro-brunneus, durus, plus minusve radiatus, in maturitate irregulariter dehiscens, secedens. *Loculi* irregulariter stipati, annulati vel lineares, stroma totum occupantes. *Asci* numerosi, erecti, ellipsoidei, sessiles, apice late rotundati, incrassati (14 μ), 8-spori, 80–120 × 20–30 μ. *Sporae* 2–3-seriatae, ellipsoideae, utrinque rotundatae, 1-septatae, fortiter constrictae, atrobrunneae, leves, 30–36 × 12–15 μ, cellulis subaequalibus. *Paraphyses* numerosissimae, ascos superantes, hyalinae, filiformes, septatae, ramosae, 1 μ crassae.

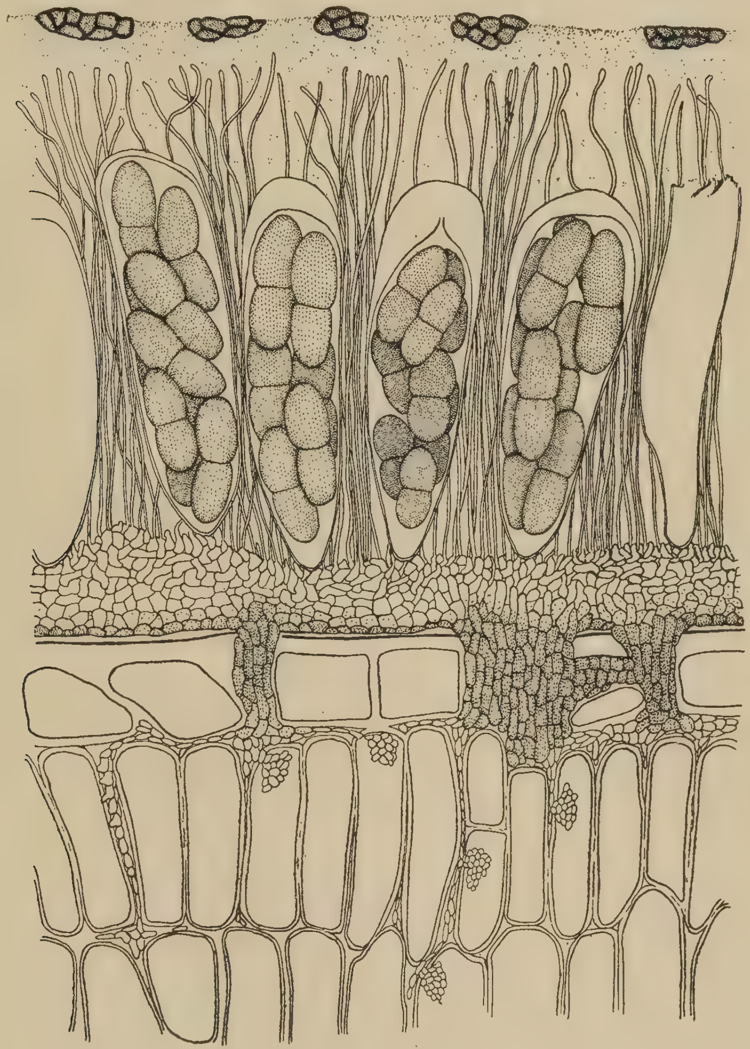

FIG. 6.—*Hysterostomella Gymnosporiae* Hansf.
Section through one locule. × 1000.

Hab. in foliis *Gymnosporiae lepidotae,* Kalonge, Mt. Ruwenzori, Congo Belge, *Hendrickx 2672.*

The mycelium penetrates the upper layers of the leaf mesophyll as intercellular septate hyaline hyphae, and enters many cells of the upper palisade layer to form small masses of hyaline parenchyma, resembling coralloid haustoria, but never filling such cells ; other cells are turned dark brown to black. Beneath the epidermis the mycelium forms a thin continuous hyaline layer, and in places this extends up between the cells of the epidermis as columns of dark parenchyma, passing directly through the cuticle and connecting with the basal wall of the external ascostroma. The latter is of typical structure for this genus. (Fig. 6.)

91. **Asterinella Randiae,** sp. n.

Plagulae hypophyllae, atrae, densae, orbiculares, usque ad 2 mm. diam., saepe numerosae confluentesque, leves. *Mycelium* ex hyphis atrobrunneis, flexuosis, exhyphopodiatis, 5–6 μ crassis, (cellulis circa 20 μ longis), irregulariter ramosis, dense reticulatis compositum, pluries affixum ; mycelium innatum subcuticulare, pelliculosum, ex hyphis hyalinis irregulariter subradiantibus compositum, haustoriis nullis. *Thyriothecia* atra, rotundata, convexa, 80–120 μ diam., levia, dense dispersa et in centro plagularum late connata ; paries inferior indistinctus ; paries superior ex hyphis atrobrunneis, radiantibus, 3–4 μ crassis, (cellulis 5–8 μ longis), compositus, margine haud fimbriatus, pauci-stellatim dehiscens, cellulis centralibus secedentibus. *Asci* aparaphysati, usque ad 20, globosi, sessiles, 8-spori, usque ad 30 μ diam. *Sporae* conglobatae, dilute brunneae, oblongae, utrinque rotundatae, 1-septatae, constrictae, cellula superiore lenissime crassiore, episporio subtiliter punctato, 15–18 × 7–8 μ.

Hab. in foliis *Randiae* sp. indet., Yangambi, Congo Belge, *Hendrickx 3017.*

The internal mycelium consists of a continuous subcuticular sheet of small subradiate hyaline hyphae beneath the whole external colony, to which it is connected direct through the cuticle at many points. No haustoria are formed in the epidermal cells and there is no further penetration of the host. The stomata are filled with dark plugs of external mycelium, but these do not penetrate below the guard cells. On germination the lower cell of the spore forms a short hypha of variable length, with a terminal appressorium or ' hyphopodium ' irregularly ovate, about 8 × 5 μ ; from the lower surface of this a fine hypha penetrates the cuticle and then develops into the internal subcuticular mycelium ; meanwhile the upper cell of the spore has collapsed, and the external dark mycelium develops directly from the ' germ tube ' and appressorium.

92. **Asterolibertia Parinarii** (Syd.), comb. n.

Syn. *Asterina Parinarii* Syd. in Ann. Myc., **36**, p. 180, 1938.

On *Parinari subcordatum,* Yangambi, Congo Belge, *Hendrickx 3022.*

The description given by Sydow is accurate, but the intercalary hyphopodia separate the fungus from *Asterina* and place it in *Asterolibertia* Arnaud. The hyphopodia are rregularly scattered along the hyphae, but always single, and sometimes by the irregular development of the parent hyphae become almost truly lateral ; occasionally they are terminal on short hyphae, when they are usually formed in close proximity to another hyphopodium intercalary in a different hypha. (Fig. 7.)

93. **Asterina caseariicola,** sp. n.

Plagulae amphigenae, plerumque epiphyllae, tenues, atrae, leves, usque ad 2 mm. diam., saepe numerosae et late confluentes. *Mycelium* ex hyphis atrobrunneis, subrectis, 5 μ crassis, (cellulis plerumque 20–30 μ longis), opposite

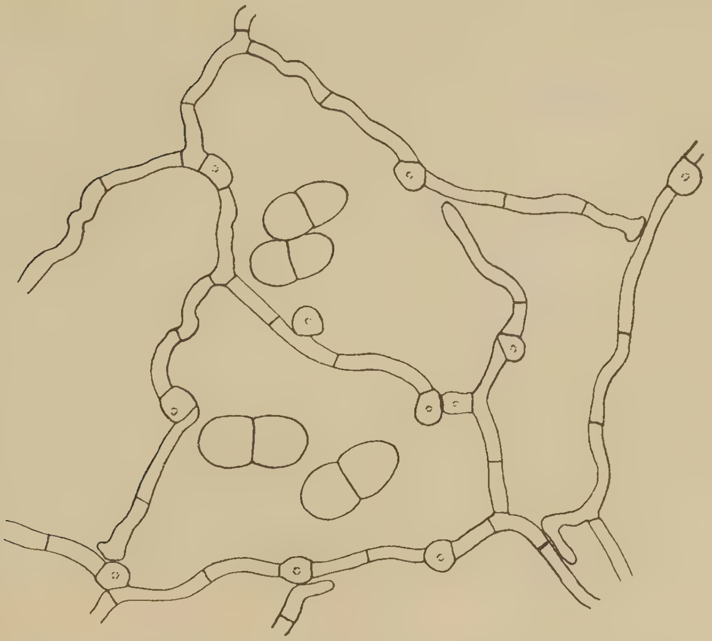

FIG. 7.—*Asterolibertia Parinarii* (Syd.) Hansf.
Mycelium with intercalary hyphopodia ; also four ascospores. × 1000.

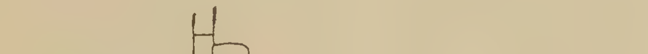

FIG. 8.—*Asterina caseariicola* Hansf.
Mycelium with hyphopodia ; two germinating ascospores. × 1000.

vel irregulariter ramosis, laxe reticulatis compositum. *Hyphopodia* numerosa, opposita vel alternata, suberecta, continua, digitata, recta vel lenissime curvata, apice rotundata, integra 8–15 × 6–7 μ. *Thyriothecia* laxe dispersa, atra, levia, rotundata, plerumque discreta, 120–140 μ diam., convexa; paries inferior indistinctus; paries superior subopace atrobrunneus, ex hyphis radiantibus 3–4 μ crassis, cellulis 5–8 μ longis compositus, margine fimbriatus, hyphis fimbriarum tortuoso-radiantibus, exhyphopodiatis, dilute brunneis, usque ad 70 μ longis, plurie stellatim dehiscens, segmentis anguste triangulatis, cellulis centralibus secedentibus. *Asci* 6–8, aparaphysati, in ordine maturescentes, globosi, sessiles, 8-spori, usque ad 50 μ diam. *Sporae* conglobatae, atrobrunneae, oblongae, utrinque rotundatae, 1-septatae, fortiter constrictae, 25–30 × 14–15 μ, cellula superiore leniter crassiore, episporio dense echinulato (–1 μ). (Fig. 8.)

Hab. in foliis *Caseariae Engleri*, Entebbe, Uganda, *Hansford 3724 p.p.*

94. **Asterina Macarangae**, sp. n.

Plagulae epiphyllae (inter plagulas *Schiffnerulae* sp. dispersae), atrae, tenues, leves, aegre perspicuae, usque ad 1 mm. diam. *Mycelium* ex hyphis flexuosis, brunneis, 3·5–4 μ crassis (cellulis plerumque 15–20 μ longis), irregulariter ramosis, laxe reticulatis compositum. *Hyphopodia* alternata vel saepe subopposita, continua, hemisphaerica vel ovata, subinde subangulosa, haud lobata, 5–9 μ alt. et 6–10 μ cr. *Thyriothecia* laxe dispersa, rotundata, plerumque discreta, atra, primo subconica, usque ad 80 μ diam.; paries superior atrobrunneus, ex hyphis radiantibus, 3–4 μ crassis, cellulis 4–8 μ longis compositus, margine fimbriatus, hyphis fimbriarum usque ad 30 μ longis, tortuosis exhyphopodiatis, dilute brunneis; thyriothecia in globo mucoso gliscens, cellulis parietis secedentibus, haud stellatim dehiscens; paries inferior indistinctus. *Asci* usque ad 8, in ordine maturescentes, sessiles, globosi, 8-spori. *Sporae* conglobatae, atrobrunneae, oblongae, utrinque rotundatae, 1-septatae, constrictae, 23–27 × 13–14 μ, cellulis subaequalibus, episporio levi. (Fig. 9.)

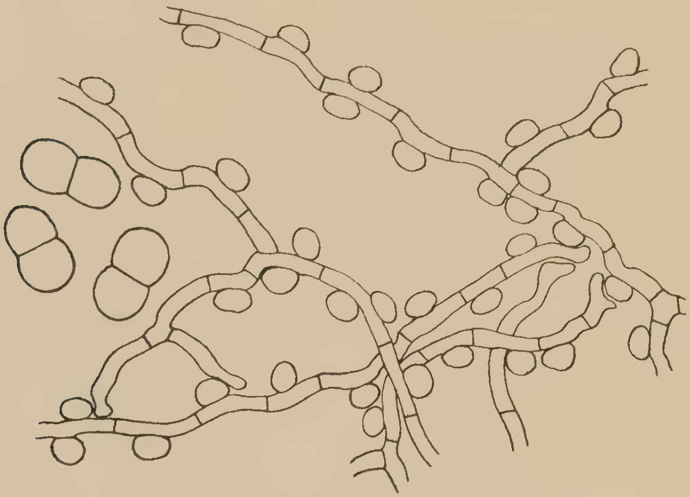

Fig. 9.—*Asterina Macarangae* Hansf.
Mycelium with hyphopodia, three ascospores. × 1000.

Hab. in foliis *Macarangae* sp., Mt. Kahuzi, Kivu, Congo Belge, *Hendrickx 3158*.

The colonies are epiphyllous, small and scarcely visible, scattered amongst those of a species of *Schiffnerula*, from which they are distinguished by their

thinner appearance, and by the narrower hyphae. The thyriothecia are at first of normal *Asterina* structure, developing below the mycelial hyphae as radiate flat plates, fimbriate at the margin. Later by development of internal mucus they swell up to become almost globose, and then strongly resemble the perithecia of a *Schiffnerula*, but can be distinguished from such by the residual traces of the original radiate structure and by the larger number of asci. There is no sign of stellate dehiscence, and the cells of the upper wall become disintegrated and disappear, exposing the asci contained in the central mass of mucus.

95. ASTERINA PERAFFINIS Speg., Fung. Puigg. no. 355, 1889.
On *Marsdenia angolensis*, Ruambira, Kivu, *Hendrickx 2628*.
This is the first record of this species in tropical Africa.

96. **DICTYOASTERINA,** gen. nov. ASTERINACEARUM.

Mycelium, hyphopodia et thyriothecia *Asterina* consimilia. Sporae oblongae vel clavulatae, brunneae, primo inaequaliter 1-septatae, postremo muriformes.

Dictyoasterina Conopharyngiae, sp. n.

Plagulae epiphyllae, atrae, leves, tenues, usque ad 2 mm. diam., demum subsolidae. *Mycelium* ex hyphis atrobrunneis, subrectis, 6–8 μ crassis, (cellulis plerumque 30–50 μ longis), opposite vel irregulariter ramosis, laxe reticulatis compositum. *Hyphopodia* laxe dispersa, alternata vel unilateralia, hemisphaerica, atrobrunnea, integra, 14–18 × 10–12 μ. *Thyriothecia* composita,

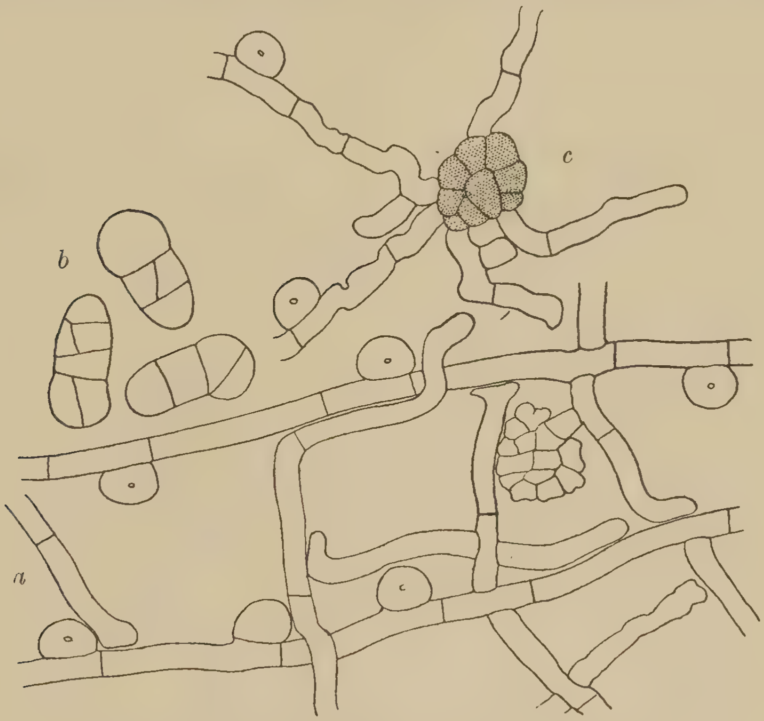

FIG. 10.—*Dictyoasterina Conopharyngiae* Hansf.
(*a*) Mycelium with hyphopodia, and one rudimentary thyriothecium ; (*b*) three ascospores ; (*c*) germinating ascospore. × 1000.

medium plagularum occupantia, usque ad 1 mm. diam., levia, atra, rotundata, margine crenata; paries inferior hyalinus, ex hyphis hyalinis, indistincte radiantibus compositus; paries superior ex hyphis radiantibus, atrobrunneis, 3–4 μ crassis, cellulis 10–20 μ longis compositus; irregulariter dehiscens, partibus centralibus secedentibus. *Asci* numerosi, aparaphysati, globosi, sessiles, 8-spori, usque ad 60 × 50 μ. *Sporae* conglobatae, brunneae, oblongae, utrinque rotundatae, primo inaequaliter 1-septatae constrictaeque, demum transverse 3-septatae, cellulis majoribus longitudinaliter 1-septatis, episporio tenui, dilute brunneo levi; sporae maturae 33–39 × 17–20 μ, parte superiore crassiore, breviore.

Hab. in foliis *Conopharyngiae* sp., Entebbe, Uganda, *Hansford 3713 p.p.*

The mycelium is typical of many species of *Asterina*, though the hyphopodia are rather large and each has a conspicuous pore on its lower surface, where the haustorium originates. The thyriothecia commence as small numerous radiate plates beneath the mycelial hyphae, but eventually these coalesce to form a single large composite ascoma occupying the whole of the centre of the colony. The spores are at first of the usual *Asterina* type, but as they mature within the ascus they become transversely 3-septate, with one to three cells longitudinally or obliquely 1-septate; the spore wall remains smooth, thin and pale brown. After discharge and during germination the spore swells, becomes almost opaque dark brown and the cells become further divided, until a subglobose mass of cells about 25–30 μ diam. is formed; apparently the upper and widest half of the spore collapses and disappears. From this dark mass of cells hyphae of the mycelium originate, and form normal hyphopodia as they spread out over the leaf surface. The germination, therefore, as well as the septation of the spores, is rather different from that of normal species of *Asterina*. (Fig. 10.)

97. **Acrospeira Pseudarthriae,** sp. n.

Mycelium ex hyphis dilute olivaceis vel subhyalinis, 2–3 μ crassis, septatis, irregulariter ramosis, flexuosis compositum, in hypophyllo repens et in pilos folii ascendens. *Conidiophora* haud distincta. *Conidia* singulariter, irregulariter, lateraliter dispersa, ex cellula singula, globosa, 5 μ diam. orta, demum globosa, subopace atrobrunnea, levia, muriformia (circa 20 cellulas continentia) 20–35 μ diam.

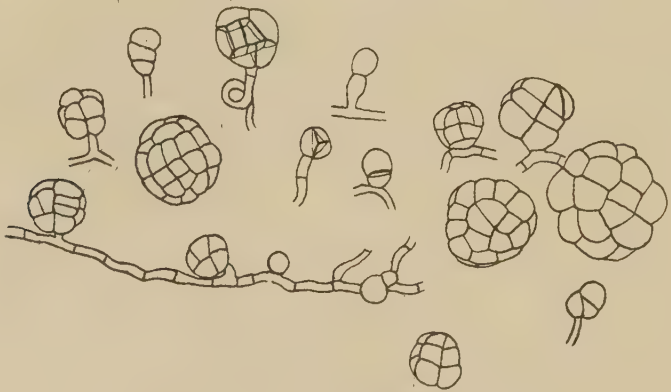

FIG. 11.—*Acrospeira Pseudarthriae* Hansf.
Mycelium and conidia. × 1000.

Hab. in foliis *Pseudarthriae Hookeri* Kitega, Urundi, Congo Belge, *Hendrickx 2611.*

The fungus is scarcely visible on the lower side of the leaves ; the mycelium creeps over the epidermis and climbs up the leaf hairs on which it appears to be parasitic. No conidiophores are differentiated and the conidia arise as a single globose cell lateral and usually sessile on the parent hypha, though sometimes with a short stalk cell, which later is obscured. The original cell enlarges and becomes muriform, but there is little trace of any spiral development analogous to that described by Wiltshire (Trans. Brit. Myc. Soc. **21**, pp. 229–236, 1938) for some other species of this genus. (Fig. 11.)

98. **Cercosporella Indigoferae,** sp. n.

Maculae nullae, sed folii toti maturi flavescentes utrinque passim tenuiter albo-mucidi. *Conidiophora* 6–10-fasciculata, ex stomatibus emergentia, stromate stomatali nullo, hyalina, usque ad 80 μ longa, (in hypophyllo ad 120 μ), 6–7 μ cr., 3–6-septata, simplicia, sursum cicatricibus planis, prominentibus, dispersis praedita. *Conidia* filiformia, hyalina, 3–8-septata, apice longe attenuata, 1–2 μ cr., deorsum usque ad 4·5 μ cr., basi truncata, vix incrassata, 50–150 μ longa.

Hab. in foliis *Indigoferae* sp., Kawanda, Kampala, Uganda, *Hansford 3691.*

The fungus does not cause definite leafspots, but occurs on both surfaces of the mature leaves as irregular patches of thin white mould, consisting of the small fasicles of conidiophores and conidia emergent through the stomata.

99. **Teratosperma Meliolae,** sp. n.

Mycelium in plagulis *Meliolae* parasitans, ex hyphis dilute brunneis, 2–4 μ crassis, septatis, irregulariter denseque ramosis, exhyphopodiatis densissime reticulatis compositum, hyphas hostis velans. *Conidiophora* irregulariter denseque dispersa, erecta, continua, recta, brunnea, usque ad 12 μ longa, 3–4 μ cr., recta, apice in cyatho minuto expansa. *Conidia* singula, terminalia, basi in cyatho conidiophori inclusa, primo ovata, muriformia, atrobrunnea, levia,

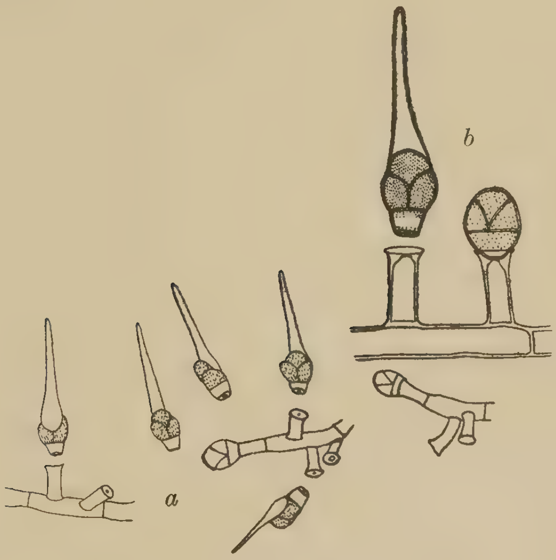

Fig. 12.—*Teratosperma Meliolae* Hansf.
Mycelium and conidia. (*a*) ×500 ; (*b*) ×1000.

ex cellula basali singula et aliis tribus vel quattuor composita, quarum una in rostrum hyalinum, rectum, acutum, usque ad 30 μ longum producta est; corpus conidii 11–13 $\times 8 \times 7$ μ.

Hab. in plagulis *Meliolae Conopharyngiae* in foliis *Conopharyngiae* sp., Entebbe, Uganda, *Hansford 3713 p.p.*

The mycelium closely invests the hyphae of the *Meliola* host with almost a solid covering of brown narrow hyphae, which on their upper surface bear the irregularly arranged erect conidiophores, of which two or three are often arranged on a single mycelial cell. The conidiophores are straight, erect, brown, continuous, and expanded above slightly into a small cup, with a central dark spot, the cup being about 4–5 μ diam. and about 1 μ deep. Into this cup fits the basal cell of the conidium, and this bears an ovate mass of three or four dark cells, of which one eventually grows out into an apical acute straight thin-walled smooth beak up to 30 μ long; the body of the conidium is 11–13 $\times 7 \times 8$ μ. This method of conidial formation is very peculiar, and it may be necessary at a later date to erect a new genus for this fungus, which has been collected only twice in Uganda, the other collection being on *Irenopsis molleriana* on *Hibiscus*. (Fig. 12.)

EDMUND DAVALL, F.L.S., AN UNWRITTEN ENGLISH CHAPTER IN THE HISTORY OF SWISS BOTANY.

By G. R. de Beer, F.R.S., Pres.L.S.

[Plates **1–3**, and a map.]

Among the names on the first page of the signature-book of The Linnean Society of London is that of Edmund Davall, one of the earliest Fellows of the Society. On 15 July 1788, a certificate was filed stating that 'Mr. Davall, an English gentleman resident in Switzerland, was proposed as a Fellow', signed by William Curtis, James Dickson, and Jonas Dryander. He was admitted a Fellow on 16 September 1788.

Very little is known of Edmund Davall *, and the entry under his name in the D.N.B. is meagre and inaccurate. While examining the Smithian papers after their return to the Society's rooms from their wartime place of safety, I had occasion to peruse the correspondence between Davall and Sir James Edward Smith, First President †. I was struck by the interesting light which these papers throw not only on the sympathetic and rather tragic figure of Edmund Davall, but also on the relations between several celebrated naturalists of the day. Some of these, such as La Chenal, Wyttenbach, and de Saussure were in intimate association with the great Haller. Davall stood, from his relations to Smith, in the Linnaean succession, and therefore occupied an interesting position in the scientific world of his day, particularly in Switzerland, where the influence of Haller was still strong. I was also struck by the very human nature of the correspondence and its reference to events and situations which have had more exact counterparts in times quite recent than in the century and a half which have intervened since the letters were written. In making a few extracts from these letters I have included some of these details, since it is not without interest to appreciate the conditions under which the earliest Fellows of the Society worked.

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* He is mentioned and referred to as of Scottish origin in the *Dictionnaire Historique et Biographique de la Suisse*, Neuchâtel 1924.

† Some of the correspondence between Davall and Smith was published in Lady Smith's *Memoir and Correspondence of the late Sir James Edward Smith*, London 1932, but with many omissions, inaccuracies, and emendations.

It is known that Edmund Davall was born in the Parish of St. Andrew's, Holborn, in London, in August 1763 [*], and that his mother, Charlotte Thomasset, was Swiss [†]. His father, also of the name of Edmund Davall, of Hatton Street, London, is described as 'storekeeper of the navy slop-office in Crutched friars', i.e. storekeeper of navy clothing stores [‡]. They were married in London, 25 December 1758. Further details of his early life are contained in the following autobiographical note.

'(27 Jan^{y} 1796)[§]

'It was just at the epoch of the death of my Father [||] that I began to have some vague notion of Botany—that I perceived it was possible to acquire some knowledge of that enchanting Study by means of solitary application—I had from my cradle a latent germen which unfortunately not having had the happiness of reckoning among my early acquaintance any one properly given to Nat: Hist. had waited for impregnation till that moment—Having always been fond of Gardening I had bought Millers Kalendar & it was there I *first* saw a sketch of the Linnean System. I was suddenly inflamed & at this critical period resolved to pursue a Study which I was certain would be productive of better happiness than any plan that might lead to pecuniary advantage—With my Father I lost my home in my native Country—for my Mother after this separation was earnestly desirous of finishing her days in the Country which gave her birth—thus I became from the nature of my circumstances exiled, as it were, to this Country :—it was necessary to the pursuance of my Plan that in finding a home in the House of my Mothers Sisters I should so manage my little resources as to procure a proper stock of Books & in this my ardour carried me too far, as you know, yet surely even now I prefer this treasure (save some less necessary objects) to the possession of what more cash I might have, had I spent less in Books. . . . . . '

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[*] Information kindly supplied by Dr. A. Ganguin of Le Day, Canton de Vaud. Through the kindness of the Rev. J. R. Howden, Rector of St. Andrew, Holborn, and of Mr. Jones, Registrar, I have been able to examine the Parish Register for 1763, in which, however, Edmund Davall's name does not appear. This would not be surprising if, as tradition in Switzerland relates, Davall's father was a Scotsman.

[†] In a guide-book to Switzerland which Louis Reynier wrote in 1788 (*Guide des voyageurs en Suisse*, Paris 1790) there is the following entry under the town of Orbe, relating to one of Davall's aunts, Julie Thomasset:

'les tableaux en broderie de Mademoiselle Thomasset, tableaux d'une belle exécution et d'autant plus étonnans que cette personne a decouvert son talent dans un age où l'on cesse d'en avoir, à soixante ans. Dans quelques années on y verra avec plaisir le jardin botanique que le neveu de cette dame fait établir'. This last remark can only refer to Edmund Davall who was personally known to Reynier. This conclusion is supported by the entry under Orbe in J. G. Ebel's guide-book (*Instructions pour un voyageur qui se propose de parcourir la Suisse de la maniere la plus utile et la plus propre à lui procurer toutes les jouissances dont cette contrée abonde*, Basle 1795) :—

'Une chose qui mérite d'être vue, ce sont des tableaux qu'une Demoiselle *Thomasset* y travailloit à l'aiguille et en soye, d'après les plus grands maitres et d'après nature. Un Anglois, M. *Davalt*, qui réside à Orbe, en a fait l'acquisition et possède de plus une superbe bibliothèque avec un Jardin de Botanique et un Herbier très-riche'. Mlle. Thomasset had died, and it is known that one of Davall's aunts died in 1789.

Lastly it is known from the account of a later traveller ([C. G. Hölder] *Meine Reise durch Wallis und Pays de Vaud. Im Jahr 1803*, Stuttgart 1805), that the subjects of these embroideries included 'Ein Porträt des grossen Gariks' and 'Ein alter bärtiger Greis, welcher einst durch die Strassen von London sang' from which it may be concluded that Mlle. Thomasset had had close relations with England.

[‡] It is stated by W. Berry's *Encyclopedia Heraldica* that arms of gules semée-de-lis argent, a lion rampant or, were borne by Thomas Davall, Esq., Merchant of London, anno 1650. Thomas Davall's arms are also mentioned by Edward Hatton in his *New View of London* (1708). Thomas Davall, who died in 1660 aged 44, would seem to have been an ancestor of Edmund Davall, for the latter's grandson, Emile-Frederic Henri-Edmond Davall had these arms included in a stained glass window at La Cour au Chantre, Vevey, in 1887. Mr. Trappes Lomax has, however, kindly informed me that no such grant by the College of Arms can be traced. There is, further, the fact that in 1822 a Mr. Burr, whose Mother was a Davall, took out a grant of arms for her of gules a lion rampant within an orle of eight fleurs-de-lis argent, the lion also argent supporting a golden ducal crown in his forepaws. It would appear therefore that the College of Arms in 1822 was unable to trace any grant in 1650. The arms of Davall are given in the *Armorial Vaudois* of D. L. Galbreath (Baugy sur Clarens, 1934) as de geules semé de fleurs-de-lis d'argent au lion brochant d'or.

There was also a Peter Davall who was elected into the Fellowship of the Royal Society in 1740, became Secretary in 1747, was one of the original members of the Royal Society Club, and died in 1763; but his relationship to Edmund Davall is not known.

[§] Linn. Soc., Smith MSS. 14, 196.

[||] Edmund Davall senior died on 5 April 1784 'at his house in Hatton-Street, of a mortification in his leg' (*Gentleman's Magazine*, 1784, p. 317).

There can be no doubt that Davall had quickly made a reputation for himself in his country of adoption. The proceedings of the 'Private Society of Friends of Natural History in Berne' for 29 March 1787 refer to a paper by Davall on some plants of Switzerland not enumerated in Haller's great work *. On 26 October 1787, the same Society heard a paper by the younger Albrecht von Haller on some rare plants which he had found in company with Davall †, and on 23 May 1788 Haller laid before the Society some more plants which he had received from Davall ‡. Many additions to the Swiss flora made by Davall are listed in Reynier's 'Mémoires'. §

At some time about the beginning of 1788 Davall lost his mother ||, and made a journey to England. He was given letters of recommendation to Sir James Edward Smith by two Swiss naturalists of repute : Jacob Samuel Wyttenbach of Berne ¶, and Jean Senebier of Geneva **, both of whom Smith had met on his travels in the previous year ††. In this way, Smith made the acquaintance of a young countryman, and a great friendship was formed which no cloud ever marred.

Early in 1789 Davall returned to Switzerland and wrote his first letter to Smith :

'Pontarlier en Franche Comté 1st Feby 1789 ‡‡.

'My dear Sir

'My time & *day-light* at Paris were so employed as not to permit me to write as I had promised—I had every reason to be well satisfied with the persons

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* Daval. Verzeichniss einiger Schweizerpflanzen, welche in der Historia Plantarum des sel. Herrn von Haller nicht gefunden werden. Verhandlungen der Privatgesellschaft naturforschender Freunde in Bern. Versammlung vom 29 Brachmonat, 1787, p. 62, Mscr.

† Haller, Alb. fil. Enumeratio Staudarum rariorum, quas comite Davall, Botanophilo Anglo, invenit Diebus 31 Julii et 1 Augusti 1787. Ibid. Sitzung vom 26 Oktober 1787. Mscr.

‡ Verlegung von Pflanzen durch Herrn Haller, die er von Herrn Daval empfangen hatte. Ibid. Sitzung vom 23 May 1788, Mscr. (Note.—These three references are contained in *Bibliographie der Schweizerischen Landeskunde*, Faszikel IV. 3, Flora Helvetica, Ed. Fischer, Bern 1901).

§ *Mémoires pour servir à l'histoire physique et naturelle de la Suisse*, Lausanne 1788. Already by 1788 the list included the following plants (in Reynier's nomenclature) with the localities in which Davall found them : *Tragopogon majus* Jacq. (Valais), *Selinum Chabraei* Jacq. (Romainmotier), *Tordylium maximum* L. (Orbe), *Dianthus virgineus* L. (Suchet), *Geum hybrideum* Jacq. (Leukerbad), *Scilla amoena* L. (Fenalet), *Orchis palustris* Jacq. (Vevey), *Clavaria cornuta* Lightfoot (Orbe).

|| The D.N.B. states that Davall lost his father in 1788. This is incorrect in view of the autobiographical note on p. 43 and the fact that Davall was already an accomplished botanist in Switzerland in 1787. The error rests on an incorrect deduction from a passage in a letter from the Marchioness of Rockingham to Sir J. E. Smith in 1788 (*Mem. & Corr.*, vol. 2, p. 12) regretting 'he has lost a valuable beloved parent'. This referred to his mother.

¶ Berne, 16 April 1788. Linn. Soc., Smith MSS. 10, 161. Jacob Samuel Wyttenbach (1748–1830), F.M.L.S., 1788. Pastor and Naturalist of Berne.

** Geneve, 3 March 1788. Linn. Soc., Smith MSS. 9, 80. Jean Senebier (1742–1809). Historian and botanist of Geneva.

†† *A sketch of a Tour on the Continent*, London 1793, Vol. 3, pp. 148, 172.

‡‡ Linn. Soc., Smith MSS. 14, 1.

of learning I saw—Broussonet * took me to the Académie des Sciences where I saw the Turinois † who kissed L M: S:—. . . . . .

'Reynier ‡ is more mad than ever intriguing & meddling wth Politicks He may some time or other have opportunity of reflection in the Bastille—I really regret him as an observer of considerable perspicacity. . . . . .'

In his next letter Davall makes the first mention of a work on Swiss plants that he was contemplating.

'Orbe, Canton de Berne en Suisse. for the post of 24 Feb^{ry} 1789 §

'. . . . . . Reynier asked me whether I did not think of undertaking something at present—I answered that I might possibly attempt to act as his representative or rather repair in some degree the loss we sustain here by his desertion—he thought it highly absurd that what I might attempt should be in Latin & at the same time observed "vous devriez nous donner vos observations en François comme *Suite à mes Memoires* || &c &c" . . . . . .'

Davall then went on to speak of his garden and method of working.

'In going round my garden yesterday I was much surprised at seeing a plant coming into flower which I had been taught to expect in autumn—in an excursion to the warm part of the Vallais in April 1787 I brought home 2 roots which I *suspected* to be *Colchicum montanum* ¶ they put forth leaves last spring before I sett out on my journey to England but did not flower perhaps on account of their being newly removed from home. I have now one before me in a Pot putting forth leaves & a flower which is not yet open—since I have written thus far the idea has occurred that it may prove on examination to be the *Bulbocodium* ** I very much suspect and hope it may be so as this will be a valuable addition to the Swiss Flora—'

Reynier had clearly embraced politics sufficiently to abandon botany to the extent of selling his herbarium which Davall bought.

'Orbe Canton de Berne en Suisse 5 May 1789 ††

'. . . . . . I wish Reynier were expelled the Linn: Society he is utterly unworthy of a place as an arrogant & foolish enemy of Linnaeus ‡‡ and as an

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* Pierre Marie Auguste Broussonet (1761–1807), F.M.L.S., 1788.

† It is possible that this refers to the distinguished botanists, Carlo Allioni (1725–1804) and Carlo Antonio Bellardi (1741–1826), both of Turin.

‡ Louis Reynier (1762–1824), of Lausanne, F.M.L.S., 1788. One of the founders of the Société Linnéenne Vaudoise, and of the Société Vaudoise des sciences naturelles. During Napoleon's campaign in Egypt he formed part of the French administration in Cairo. Later he acted as Administrator of Forests and Highways in Calabria for the King of Naples, and after 1815 he became Postmaster-General at Lausanne.

In his *Alberti von Haller Icones Plantarum Helvetiae*, Bernae 1795, p. xxxiv, J. S. Wyttenbach referred to Reynier as follows :—

Cl. *Reynier* Lausannensis, nunc Parisiis degens ; omnibus, dum adhuc in patria viveret, quasi nervis contendit, inque eo laboravit, ut stirpium nostrarum historiam illustraret, ejusque extenderet limites. Verum plura praestitisset, ni juvenili abreptus ardore & praeceps in nova novisque similia semper ruisset, unde factum, ut judiciis minus saepe sobriis novas species proderet, quarum plures aut varietates esse aut plantas jam notas dehinc satis probatum fuit. Multa nihilominus congessit, nova, *Favrodii* praecipue auxilio, detexit, dubia solvit & rei nostrae botanicae emolumento fuit, quod ex variis ejus dissertationibus, quamquam & ipsis saepius praecocioribus, patet.

§ Linn. Soc., Smith MSS. 14, 5.

|| This work was the *Mémoires pour servir à l'histoire physique et naturelle de la Suisse* which Reynier edited with H. Struve, and of which the first and only volume appeared at Lausanne in 1788.

¶ *Colchicum alpinum* DC.

** *Bulbocodium vernum* Linn.

†† Linn. Soc., Smith MSS. 14, 9.

‡‡ In the *Mèmoires pour servir à l'histoire physique et naturelle de la Suisse* (Lausanne 1788), speaking of Linnaeus, Reynier had written 'le travail de cet auteur et la création de son système, ont plutôt nui aux progrès de la botanique, que contribué à son avancement . . . . . .'

errant knave those who knew him here such as Wyttenbach, Van Berchem * &c despise him for the manner in which he has acted relating to the sale of his Herbarium he has imposed on my confidence in the most rascally manner I find very few interesting plants & *not one duplicate* moreover no instruction—Vaccinium Vitis Idea named Arb. Uva Ursi.—Chaerophyll: sylvestre named Conium maculat: as I hope some time or other to shew you *here* he is no longer *Reynier* but signs himself *De Reynier* ! ! ! '

Davall then returns to the subject of his work on the plants of Switzerland.

' Wyttenbach offers me his good services to get my little affair printed handsomely at *Berne* which I shall prefer to Lausanne—I am ashamed not to have done any thing yet but shall endeavour to make up for lost time—The Collector of the Convent of the Great S^t Bernhard dined with us not long since when I promised to go and see him in July chiefly (on my honour) for you my good friend in hopes of your Lichen *cucullatus* ? a small bit of which I think is in my Reynier's herbarium . . . . . . '

In his next letter, Davall introduces his friend Mr. DuCros † and describes how he passes his time.

' Orbe Canton de Berne en Suisse 22 May 1789 ‡
' . . . . . . I take the liberty of addressing to you a box of Cryptogamia for M^r Dickson from my friend DuCros . . . that you may have a provision we go together in August for a week or 10 days to the Convent on the top of S^t Bernard which is said to be the most elevated habitation known by much higher than the plain of the delightful Mont Cenis . . . . . I sett off in an hour on a fishing party on a lake in the neighbouring mountains—Le Lac de Joux & hope to find something on the way as soon as that is done I shall visit some of the highest points of the neighbourhood.'

Meanwhile the Linnean Society had proceeded to the election of some Foreign Members, and the Diplomas of those who lived in Switzerland were sent by Smith to Davall to be forwarded.

' Orbe 27 October 1789 §
' . . . . . . M^r Tingry || very soon after wrote me a very civil letter on receiving his Diploma—Wyttenbach received his about the same time & I delivered that of Van Berchem to him as I passed at his house on my way to the Great S^t Bernard. This last person gave me a complete farce on the occasion which would occupy too much space in this sheet— '

Some of the results of this expedition are described in subsequent letters :

' One time or other when you are at S^r J. Banks's without much to do read Saussure Voyages dans les Alpes Vol: 2. p. 465. chapter XLV, Glacier de la Valsorey which is very good—you will then *see* for a moment the spot where

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* Jacob Peter Berthout van Berchem (1763–1832), F.M.L.S., 1788. It was van Berchem who at Wyttenbach's request supplied William Coxe with a catalogue of Swiss fishes and Amphibia for his Faunula Helvetica which appeared in his *Travels in Switzerland and the Country of the Grisons*, London 1791.

† François-Barthélemy DuCros (1751-1822), pastor of Nyon ; referred to by Wyttenbach, *Albert von Haller Icones Plantarum Helvetiae*, Bernae, 1795, p. xxxv, as ' graminum & cryptogamistarum ingeniosissimus scrutator, multa nova detexit.' Davall says of him ' . . . . . I consider him as by far the most accurate observer I know anything of in Switzerland. His favourite part is the Study of Mosses . . . . ' Linn. Soc., Smith MSS. 14, 155.

‡ Linn. Soc., Smith MSS. 14, 11.

§ Linn. Soc., Smith MSS. 14, 18.

|| Pierre-François Tingry (1743–1821), F.M.L.S., 1788. Apothecary and mineralogist of Geneva.

I gather'd Gentiana tenella Rottb: & N. Illustr: Fl: Helv: tab: 6. I crossed the glacier & looked into the Gouille à Vassu [*]. . . . . .' [†]

' . . . . . . I can send you a most charming specimen in fine preservation of one of the rarissimae plants of Switz: gather'd by me this last season on Gt St Bernd Sisymbr: tanacetifolium . . . . . .' [‡]

Davall then introduces Smith to his favourite collecting ground, Mont Suchet in the Jura [§], and starts the series of queries on identification and determination of species which form such a feature of this bulky correspondence.

' Orbe, Canton de Berne en Suisse 24th of Novr 1789 [||].

' . . . . . . I have an Arenaria which I do not well understand, shall send you several of my best spec: as it is within my reach on the nearest mountain *Suchet* mentioned often by Haller ex: gr. under Stachys alpina Festuca decumbens &c— I have Sonchus canadensis [¶] on the same mountain which I call *my Mountain* a Ribes which I think petraeum Jacq: but you shall become acquainted personally with my good Friend *Suchet* . . . . . . God bless you for your charming & precious specimen of Diapensia lapponica gathered by L. a piece of the Cross is less precious to a bigot Catholic—it shall soon be framed and glazed . . . . . .'

Present Fellows of the Linnean Society need not be shocked at this action of their First President in parting with specimens from the Herbarium of Linnaeus, for the Linnaean collections were his private and personal property and did not come into the possession of the Society until after his death There will be a lot more to say about this specimen of Diapensia.

Davall then referred to his wedding, of which he had delayed informing his friend lest Smith should think that he was about to abandon botany.

' Orbe 25–29th Janry 1790[**]

' . . . . . . I was so dissatisfied wth my position in a house wth 2 good old aunts (for one died [††] since my return here) who have no other ideas than those of that herd of silly beings called *gens du monde* eternal players of Quadrille— in a place where I find no reasonable creature to converse wth that I yeilded to the idea of uniting myself to a young lady whose conversation I had always found more agreable than any other here & whose way of thinking agrees so well wth mine—she is a year older than myself, only daughter of one of the best families in this country, but of very small fortune having 2 brothers & their estate rather encumber'd wth debt, her name was de Cottens [‡‡] . . . . . .'

Davall goes on to speak of his work on Swiss plants, and refers to an awkward situation in which he finds himself in regard to Haller and Wyttenbach.

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[*] A lake retained by the ice of the Glacier de Valsorey.

[†] Linn. Soc., Smith MSS. 14, 66.

[‡] Linn. Soc., Smith MSS. 14, 24.

[§] It is easily understandable that Davall should have fallen under the spell of Mont Suchet, for it rises majestically behind Orbe and compels attention from its shape and the fact that it is seen from everywhere in the neighbourhood.

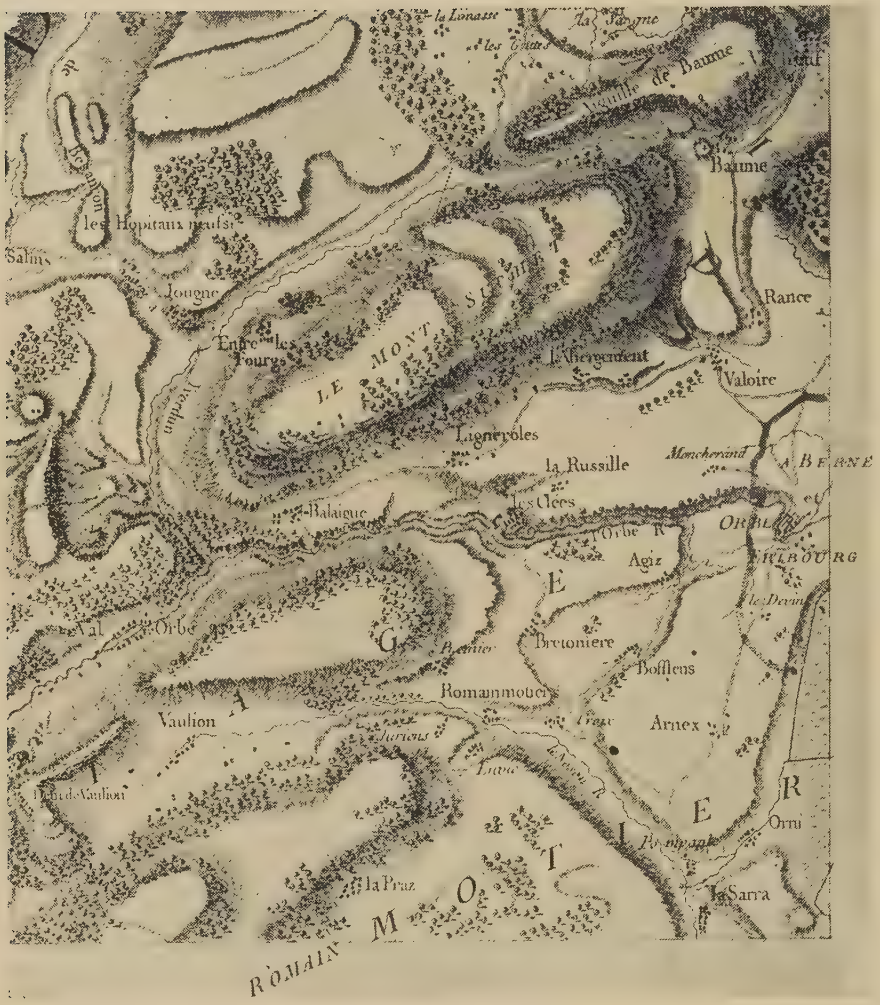
[||] Linn. Soc., Smith MSS. 14, 22.

[¶] *Mulgedium alpinum* Less.

[**] Linn. Soc., Smith MSS. 14, 24.

[††] Presumably the embroiderer. See p. 43.

[‡‡] Henriette-Louise-Stéphanie Crinzos de Cottens (1763–1839), daughter of Victor-Frédéric Crinzos de Cottens and of Louise-Marguerite Thomasset. The wedding took place on 4 September 1789. There was another family of similar name but unrelated : the Garcins de Cottens. Laurent Garcin, F.R.S. (1683–1752) had his name commemorated by Linnaeus in the genus Garcinia. His son Jean-Laurent Garcin (1733–1781) settled at Cottens which, like Orbe, is in the Pays de Vaud. And, like Davall, he was engaged on a work on the Swiss Flora to complete that of Haller but died before he could finish it. His collections were bought by Lord Bute (Biographie de Laurent Garcin, *Le Conservateur Suisse*, Vol. 13, Lausanne 1857) shortly after his death. Some are in the Brit. Mus. (Nat. Hist.).



'My good Friend Suchet'.

Extract from the Carte du Pays de Vaud by Henry Mallet 1781, showing the situation of Edmund Duvall's home at Orbe and his botanical collecting ground, Mont Suchet.

'Young Haller & Wyttenbach do not approve of my intended title of Illustrationes Hall. would Florilegium Helveticum do? wth cum obs. in Hall Hist &c I should have a tale to tell of these Gentlemen which you would not approve of, but it were too long: Hallers Hist. Stirp. cannot be found & the Berne booksellers wish to reprint it, as the plates are well preserved; now y^{g} H: W: &c wish to make corrections & additions & have asked me for the use of my plates when I shall have done wth them I imagined it would be in 2 or 3 years hence & half consented if it can be done wth propriety said I. They keep secret the time of printing—but La Chenal * has taught me that they addressed themselves to him to preside the new edition, he agreed on condition that he might have 2 years for the execution of the business but y^{g} Haller & the Booksellers insisting that the MSS. should be ready by *Octob: next* (of which they had never said a word to me) La Chenal declined—saying he should keep his Obs: & discoveries for his Flora Helvetica Linnaeano ordine digesta—so they wanted to get hold of my plates to publish them at the same time or before me . . . . . .'

Smith advised Davall not to lend his plates, since he would require them for a second edition.

A practical step towards the publication of his work was the preparation of the plates, and to this Davall had now addressed himself.

'Orbe, Canton de Berne en Suisse Saturday 27 Feb^{ry} 1790 †

'. . . . . . I have added 6 drawings for my work for Sowerby wth the original specimens from which they are made—if the current specific names do not please you let me know suggesting others that I may act as I always wish to do under your influence . . . . I shall write to Sowerby ‡ as soon as possible give him my compt^{s} & recommend the good execution of the plates . . . . . . Smithia sensitiva is framed & glazed in my study & I never enter without bowing to Diapensia lapponica ! ! . . . . . .'

Next there began a long series of letters in which Davall asked Smith for his comments on his identifications.

'Orbe Canton de Berne en Suisse 27 April 1790 §

'. . . . . . I have been very much out of order all this winter but hope at last to publish my little work before next March. I could wish it were done before you come out with Syst: Veg: This looks like ambition & perhaps is so—give me your advice on the title of my work They have published a prospectus of the new edition of Haller Hist: Stirp not promising to give it before Easter 1792 at soonest & I can hardly think it will be done then . . . . . . I am very much satisfied with Sowerby's figure of my Sisymbrium which I lately received . . . . . .

'I should wish very much to agree with you & have your good advice on the *differentiae specificae* of the Plants I have to mention . . . . . .'

At last Davall's progress with his drawings was sufficiently advanced to allow him to ask Smith to give Sowerby the instructions contained in the following letter.

'Orbe, Canton de Berne en Suisse 29 June 1790 ||

'. . . . . . [Mr. Mandrot] was commissioned to pay the whole of my account

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* Werner de La Chenal (1736–1800), F.M.L.S., 1788. Professor of Anatomy and Botany at Basle; friend of Albrecht von Haller for whom he travelled in search of plants.

† Linn. Soc., Smith MSS. 14, 29.

‡ James Sowerby (1757–1822), artist and botanist.

§ Linn. Soc., Smith MSS. 14, 39.

|| Linn. Soc., Smith MSS. 14, 44.

with Sowerby . . . . . My Garden has given me much employment I have been on *Suchet* my neighbouring mountain to search for a Ribes which I suspect to be rather the petraeum than rubrum I brought home several plants to advance my Herbarium & provisions for exchanges the drying took up several days as I was near the whole day in changing papers I found a shaded break between the rock on the N. side quite full of Sonchus canadensis * on the rocks above Ranunculus alpestris nivalis, Anemone alpina ? *not yet in fl*. narcissiflora Bryum pomiforme ! ! ! ! Bartsia alpina—Myagrum saxatile &c &c &c. All this with a visit from my friend DuCros has obliged me to defer several essential affairs. —if the plates are not sent off soon I shall be obliged to wait for them as they will not be here in less than 6 months—Now I would wish Sowerby 1^{o} to strike a good impression of each for you or more if you will.—2^{o} 525 of each for me but handsomely on good vellum paper as I mean to print nearly as well (if it can be done here) as your Fasc. Now I would wish Sowerby to number the Plates & write the names thus if you approve them
I. Crepis muricata. II. Micropus erectus L. III. Spartium decumbens Aiton Hort: Kew: † IV. Sisymbrium obtusifolium—(V. Androsace carnea this the readers must add as I have the plate & impressions) VI. Gentiana tenella. VII. Potamogeton retusum ? if *you* like it. VIII. Scirpus elongatus ‡. IX. Carex myosuroides Villars. or Bellardi Allion: § as you think best.— X. Agaricus venosus.—Now as they are in the order of Hall: Hist. in case the *Phyteuma* is done it must come in between the Gentiana & Potamogeton & consequently the numbers be changed from VI—

' As you have *seen* & possess all these plants I imagine you will insert them in the new ed. of Syst: Vegetab: & therefore I shall now pass over all the diff: spec. whether those we agreed on together or those I have sketched since but I must previously observe that Wyttenbach having spent a week with me lately I talked to him again on his objections & those of Haller to the title of my little work he allows *now* that the word *Illustrationes* is proper as the performance will throw light on *some* of Hallers blunders or positive assertions as in Stellaria dichotoma ! ! but as they maintain Ill. Hallerianae appears to be something done by Haller himself I have almost agreed if *you* approve to adopt *Illustrationes Florae Helveticae* & it is true that the quotation Illustr: Fl: Helv: is hardly longer than Illustr: Hallerian.—What say you ? . . . . . .

' N:B: pray desire Sowerby to mark at the corner of II. VI. VII. VIII. IX. X. F. DuCros delin. . . . . . .

' La Chenal with great reason is offended at the impertinent conduct of young Haller with respect to him—by the bye pray send me his Diploma he wrote to me lately in sending me back my Hudson & in a very confidential & friendly manner approves my plan highly & presses me to bring out my work as soon as I can. . . . . . '

' Orbe Canton de Berne en Suisse by Post of 14 Sept^{r} 1790 ||.

' . . . . . . I hope Sowerby has now done all the plates Mandrot has acted in a very unpleasant manner for me in not paying more than 10 Guineas to S. when I had desired him to pay the whole account but I shall ere long remit to you a sum sufficient for the whole . . . . . . Now let me enter on the slowness of my proceedings for certainly my work *should* now be published—I shall now give myself up entirely to it, & get thro' as well as I may ; but I feel that I am by no means fit for writing & when I have done I shall hardly be able to undertake such a business a second time ; I shall gradually make notes & if

* *Mulgedium alpinum* Less.

† *Cytisus decumbens* Walpers.

‡ *Fimbristylis dichotoma* Wahl.

§ *Elyna spicata* Schrad.

|| Linn. Soc., Smith MSS, 14, 52,

they are good for any thing offer them to you or publish by detached papers by means of our Society—I have very much at heart the establishment of my little garden which now suffers extremely for want of my care & I have so tempting a view of verdure hill & dale, meadows, corn fields, woods, mountains, marshes from my windows, that I might as well send our river back to its spring as tie myself down to sett labour in my study during the good season & I can do nothing by candlelight in winter. I am certain moreover that by giving myself up to the care of my garden & by running about I can be of much greater use to you & shall then have plenty of good specimens & good seeds to send *.—I give you my word that I shall sett seriously to work & get done as soon as possible. I am very glad to tell you that La Chenal seems to have no jealous eye on my plan he encourages me to get it done as soon as I can & seems rather to consider my plan as usefull to him for his future Flora Helv. Linnaeano ordine—in consequence of something I had written to him & which I do not well remember he answered me " Je brûle du désir de voir votre ouvrage botanique ; Bien loin d'y mettre aucun obstacle Je vous prie sincerement d'en hâter l'impression. Quant à ma Flore Helvetique Je continue à y travailler mais Dieu scait quant elle sera achevée ".—. . . . . . '

Davall went on to describe the pressure to which he was being subjected by Wyttenbach for the loan of his plates :—' I believe they would not have thought of their work if a Foreigner had not given himself the airs to come and meddle with their plants '.

But he need not have worried, as the following letter will show.

' Orbe Canton de Berne en Suisse 12 9ber 1790 †.

' . . . . . . what think you now ? Wyttenbach & Haller have given up their plan (I believe because they found they could not get thro' decently without La Chenal) In consequence of your excellent & truly friendly advice (& truly friendly you are to me on all occasions) I wrote to Wyttenbach in the firm resolution of standing all events saying in a civil manner but very positively that I could not permit a reimpression of my plates for their work—he answers me thus " La nouvelle édition de Haller Hist: Stirp: est renvoyée—la Société typographique n'a pas assez d'argent pour une entreprise pareille de sorte qu'il est apparent que tout le projet échouera—Je voudrois bien que La Chenal s'en chargeat & que Haller lui ecrivit à ce sujet. Vous voyez donc, que vous êtes entierement maitre de faire de vos planches ce que vous voulez ". . . . . . '

An additional difficulty in Davall's dealings with the younger Haller was the fact that the latter was by no means prepared to accept Linnaean determinations.

' Orbe Canton de Berne en Suisse sent to the post, 11th Febry 1791 ‡.

' . . . . . . M H. between you & I seems to give preeminence to his Father this is *natural* to be sure he has more than once in speaking of Plants with respect to which H. has misquoted L. when I have said this is not such a plant of L. answered with an air of displeasure *this is such a number of H.* . . . .'

A great part of Davall's letters was devoted to answers to Smith's questions, of which the following are examples.

' Anemone sulphurea ? all I can say of this is that I had the specimen I sent you from a man § whom Haller employed to run over the alps for plants for him & who knows many by rote. I had it from him as being certainly Hallers 1148 from *Mons* Fluelen near the Valley of S^t Nicolas conf: Hall: Hist: & it surely is so from my specimen :—there is strange confusion here . . . . . .

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* This certainly was the case, and besides Smith, William Curtis also received seeds from Davall : ' This rare species of Saxifraga [mutata] is a native of the Alps of Switzerland and Italy ; we raised it with difficulty from seeds sent us by Mr. Daval, ... ' (*Botanical Magazine*, Vol. 10, 1796, p. 351.)

† Linn. Soc., Smith MSS. 14, 60.

‡ Linn. Soc., Smith MSS. 14, 66.

§ Almost certainly Abraham Thomas (1740–1824) of Fenalet near Bex, ' the botanist of the mountains '. See *Les Naturalistes Thomas et leurs amis*, F. Cosandey, Revue Historique Vaudoise, Lausanne 1942.

'Gentiana I know not what to do with this—it is strange that it should be so *generally* taken for bavarica & bavarica LH. for verna :—I shall endeavour to say something of this in the course of my little work—it is & ever will be *my* fixed plan to respect all plants known & named by L. & to divest myself of every false notion I may have adopted in common with many others & which often very often arise from not having sufficiently studied his language & his diff: sp: as is so strikingly the case in Sonchus *alpinus* * so thought i.e: canad:—I perceive every one does not think so—they say of my 31 *bavarica LH* " it is generally thought *verna* therefore it should be continued to be called *verna* what is L^s *verna* ? He (L^s) did not then know the true *bavarica* i.e. : 32 said one "—I answer I know no *true* bavarica but the plant L^s has named so—" Oh he *must* have transposed plants in his Herb: " &c &c such is the nonsense I have heard. . . . . . '

Then there was an explanation of one of the reasons for the delay in the completion of his work.

' . . . . . . It is my earnest desire to get thro' my little work as soon as my health will permit—your communications & the repetition of some of the observations on the wild plants will surely compensate my ridiculous delay—but my good friend my greatest obstacle is the latinity—having neglected my latin from the time I left school till I gave myself up to Botany. I really am unable to perform that part properly altho' I read it sufficiently well . . . . . .'

The plates, however, had been prepared by Sowerby and Davall was anxious to pay him, which was no easy matter.

' Orbe, Canton de Berne, en Suisse March 11 1791 †
' My very dear Friend,

' I inclose a draft for 20£ not knowing well how to settle this business otherwise—I shall be much obliged to you if you will be so good the first time you see Sowerby after having received this money to pay him for me the amount of the remaining plates—Florists delight English Botany & what else he may then have to claim from me telling him at the same time that I am extremely sorry to have made him wait so long but it really is not my fault—I will endeavour to write to him soon—he sent me impressions of 4 of the plates but without the *copper plates*. . . . . . '

Then follow details of a visit which he received from one of his distinguished fellow botanists.

' . . . . . . As I had so much to say in my last long epistle I did not then tell you that young Jacquin ‡ came *en passant* to see me about the middle of November last he only staid a day & ½ as he was in a hurry to pass M^t Cenis on his way to Turin, Rome, & Naples. He was very friendly & altho' coming fresh from Berne where he had seen Haller & Wyttenbach he told me he could not approve of their project as premature &c & had given them to understand the same which possibly may not a little have contributed to make them give it up—he also told me in a cautious manner that I should do wrong to give up my plates . . . . . . '

There can be little doubt that one of Davall's greatest sources of pleasure and pride was his garden.

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* *Mulgedium alpinum* Less.
† Linn. Soc., Smith MSS. 14, 78.
‡ Joseph Franz, Baron von Jacquin (1766–1839), F.M.L.S., 1789.

'Orbe, Canton de Berne, en Suisse Saturday 30 of April 1791 *

'...... To divert my thoughts I have taken a turn in that part of my garden which I arrogantly name *the Alps*. Iberis rotundifol.† F. Viola biflora F. Laserpitium simplex ‡ coming to F. Ranunculus Thora in bud.—Ranunculus rutaefolius & parnassifol. with leaves in true alpine vigour—not garden luxuriance. Turritis caerulea All. § coming to flower—Hieracium alpinum HL. sowed last year leaves in excellent condition—also Hierac: mont. formerly Hypochaeris pontana—Phaca alpina, frigida & australis in tolerable condition Phellandrium Mutellina ‖ coming out of the ground what say you to this ? '

A new blow was now to fall and add itself to the other obstacles which conspired to delay the preparation of Davall's work. In the summer of 1791 his baby girl died. Smith had been its Godfather and sent some toys, which arrived too late.

'Orbe, Canton de Berne, en Suisse 22 July 1791 ¶

'...... My wife & myself were extremely pleased (tho' with a mixture of cruel emotion) at all the kind attentions you have shewn to our beloved child—we shall keep the playthings when they come to hand with the greatest care & shall frequently visit them with sentiments of the kindest nature for you & resignation to the will of Providence ...... '

To assist his wife to get over the shock, Davall took her to stay with La Chenal at Basle.

'...... At Basle I went over the greatest part of La Chenal's Herbarium he has his most precious plants from C. Bauhin's Herbarium which he bought for 7 guineas—between us I do not find La Ch. so rich in the plants of Switzerland as I expected or so deeply learned as one who has studied more than 35 years his *fort* is the knowledge of Books & editions &c in which he seems very well informed ...... ** '

Next Davall describes how he met the great de Saussure and induced him to submit his lichens to him for examination by Smith.

'Orbe, Canton de Berne, en Suisse 2^{d} of Dec 1791 ††.

'...... I had never taken any steps when at Geneva to get sight of M^{r} de Saussure the famous Alpine man he knowing, I know not whence, that there was an Englishman at Orbe a zealous lover of Plants *honour'd* me last summer with a visit hence our acquaintance :—he was very friendly & civil, well satisfied with my garden, where he saw several plants of Switz^{d} which he had sought for in vain, especially *Geran: phaeum* L & *lividum* Hort: Kew: of which I have sent him roots—he, as you know, is more of a *lithologist* than a Botanist.—he spent 17 days at a very great height in the Alps near the Mont Blanc (at 1760 toises height) for Barometrical observations &c in 1788 July he published an account of his expedition in the Journal de Genève, & there says that he collected, at that height, on the rocks—" une quantité très variée de Lichens, qui meriteroient d'être étudié à loisir "—he from his other occupations has not time to study them, tho' he wishes to know them—now I had learnt indirectly that he intended to make *this offer* to Hoffman ‡‡ *to send him as many specimens of Alpine Lichens as he might, on condition that*

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* Linn. Soc., Smith MSS. 14, 80.

† *Hutchinsia rotundifolia* R. Br.

‡ *Endressia pyrenaica* Gay.

§ *Arabis coerulea* Jacq.

‖ *Meum Mutellina* Gaertn.

¶ Linn. Soc., Smith MSS. 14, 94.

** Linn. Soc., Smith MSS. 14, 101.

†† Linn. Soc., Smith MSS. 14, 107.

‡‡ Georg Franz Hoffmann (1761–1826), Professor of Botany at Göttingen.

Hoffmann would constantly send him back one well named but that de Sauss. had not yet executed his intention—without losing time I wrote to M^r^ de Sauss. saying that in consequence of the offers of service he had made me I should be much oblig^d^ as I had not been able to go to Alps for some time if he would commun. what he might of Alpine Lichens, that if he would send me several spec^ns^ of each, I, knowing how much his principal employments prevent his study of these plants, would take charge to send to England, as being without any comparison the head quarters of Botany, & enjoying greater advantages than *any other country* from the possibility of comparing with the collections of Dill. & L. that I would return him spec^ns^ authentically named—that thus his collect^n^ in this part would be arranged in time with little trouble to him & I hoped to his satisfaction ; & after having said I hoped & did not doubt he might have occasion to collect several new subjects in his different visits to the greater heights I added, (*let us remember this*) & vous pourrez être tres sûr que dans le cas où l'on décriroit ou figureroit de ces derniers on ne s'appropriera point comme il n'arrive que trop souvent des decouvertes que l'on vous devra.—

'He presently answered me thus. J'accepte, M^r^ avec beaucoup de plaisir la proposition que vous me faites, pendant le sejour de 17 jours que je fis sur le Col du Géant à la hauteur de 1760 toises je m'amusois dans mes momens de loisir à recueillir un nombre de Lichens très variés & très singuliers qui croissoient sur les rochers du voisinage. Comme je n'avois point le tems de les étudier je me proposois de les envoyer à M. Hedwig ou à M. Hoffmann les deux premiers Cryptogamistes de l'Allemagne, mais puisque vous les desirez M^r^, ce sera à vous que je les enverrai . . . . . . '*

Particularly charming was the exchange of correspondence on the subject of the genus which Smith wished to name after his friend.

'London Dec. 30 1791 †

'. . . . . . I want to settle with you about a *Davallia.* What I intended for you I now find to be a Trianthema.—Would you like Trichomanes canariense, a very distinct & rather numerous genus, & *alive in our gardens* ? Or w^d^ you have some Indian genus in my uncoloured Icones ? If you like a fern the above is very eligible, & will stand near to *Dicksonia* . . . . . . '

To this, Davall replied, with deep gratitude :

'Orbe 31 Jan, 1792 ‡

'. . . . . . I shall certainly at all times be happy to be near Dickson . . . . . . '

Smith thereupon decided,

'London Feb 21 1792 §

'. . . . . . You shall have Trichomanes canariense . . . . . . '

Meanwhile Davall continued to make important observations :

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* H.-B. de Saussure (*Voyages dans les Alpes*, Neuchâtel 1796, Vol. 4, para. 2039) refers to this episode as follows :—

' Mais les rochers avoient leur surface tapissée d'une grande variété de lichens ; j'en formai une collection, dans l'espérance qu'un site aussi distingué présenteroit plusieurs productions peu communes. Mais comme je suis peu versé dans la connoissance de cette branche de la botanique, je communiquai cette collection à M. Daval, gentilhomme Anglois, établi à Orbe en Suisse, & amateur passionné de l'étude des plantes. M. Daval reconnut plusieurs especes de ces lichens & jugea les autres nouvelles. Mais comme il est aussi modeste qu'instruit, il ne voulut point prononcer qu'il n'eût consulté quelques savants particulièrement versés dans ce genre. Pour cet effet il envoya cette collection à M. le Docteur J. Ed. Smith, Président de la Société Linnéene de Londres, & propriétaire des collections de Linneus, qui a examiné avec soin toutes ces productions, & en a écrit à M. Daval . . . . . . '

† Linn. Soc., Smith MSS. 14, 109.

‡ Linn. Soc., Smith MSS. 14, 111.

§ Linn. Soc., Smith MSS. 14, 115.

'Orbe, Canton de Berne, en Suisse 31 Janry 1792 *

'. . . . . . my T[rifolium] i.e. Trif. alpestre L. is a nova civis Helvetiae which I have been so fortunate as to discover & of which neither La Chenal nor any one else that I know of knew to be a Swiss plant ; it is near Orbe & we will I hope visit the spot together.'

On 18 May 1792 † Davall wrote to tell him of the birth of a son who died almost immediately.

Very soon yet a new disturbance was to come between Davall and his work on the Swiss plants. The French had invaded Savoy and were threatening Geneva. The spectre of war had approached Switzerland.

'12th of Octobr 1792 ‡

'. . . . . . I am close to the Frontiers (at about 7 miles) now to speak openly all my uneasiness at this moment arises from my having a wife to whom I am much attached & who is pregnant, were it not for this, seeing my books, my Herbarium my hearth & every thing at stake, I should not hesitate one moment to make one among the number shoulder a musket if necessary & be cut to pieces if heaven would have it so with the hope of cutting down a wretch or 2 in the fields where I am accustomed to look for plants . . . . . . '

The threat of war did not, however, deter visitors from Switzerland, and among them Davall had occasion to meet some persons of interest.

'Orbe, Canton de Berne, Suisse 11th Janry 1793 §

'. . . . . . I who as you know live nearly as a Hermit have found myself in September last at a Table with Lady Spencer, the Duchess of Devon || & Ldy Duncannon giving them the names of some plants they had collected—the Duchess is rather indifferent as she prefers minerals to plants ! but the others particularly the Mama Ldy Spencer seems to intend seriously to study Botany & the unfortunate & interesting Ldy D. seems to have some aptitude—*they have only begun since they are on the Continent*—they winter at Pisa.—I mention this merely to give you *notice* that you may not be surprised.—I told them I had a friend in England infinitely better able to assist them than myself (by the bye they found me wonderfully clever because they had seen nothing but some blundering obsolete *amateurs* & were surprised just as I am when I go to England when I constantly say to myself on arriving "how well these people speak English" were a sailor or a fish woman the first persons I meet) that my friend was better *able* than any man whatever to instruct them ; as independent of superiour ability (dont blush this is what I said & as such what I thought) he possesses all the Mss: Library: Herbar &c of Linn.—his name ? *J. E. S.* Oh (said the Duchess) is it not Dr S. of the L. Soc :—the very same . . . . . . '

With the Alps in full view from his garden, Davall longed to visit them again, for he had not been to them since 1789.

'16 Aug. 1793 ¶.

'. . . . . . I remember to have seen a Thlaspi at the foot of the Alps in a spot which I should readily find again which was out of flower about the middle of June 1786 & which *may* be Wulfens plant—if my fortune did permit I would

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* Linn Soc., Smith MSS. 14, 111.

† Linn. Soc., Smith MSS. 14, 111.

‡ Linn. Soc., Smith MSS. 14, 132.

§ Linn. Soc., Smith MSS. 14, 138.

|| From Geneva the Duchess of Devonshire wrote to her children 5 June 1792 : '. . . . . . Yr. Dear Grandmama, Aunt & Bess [Elizabeth Lady Forster] study Botany very much ; I do a little but my favourite of all favourites is mineralogy . . . . . . ' (*The Face without a Frown,* Iris Leveson Gower, London 1944.) The great ladies spent the summer at Yverdon and would naturally have met Davall. Lady Duncannon had been seriously ill.

¶ Linn. Soc., Smith MSS. 14, 155.

go to look after it & could do great things (forgive this) in this country where very very much remains to be done—ex. gr. I would stake my Head that in any one journey in the Alps one might be sure of bringing back at least 6 new Lichens—oh ! I *must* return ere long.'

Davall could not have the Alps, and comforted himself with the Jura.

'I went one day in Aug. 1793 to *my* mountain *Suchet* in going up the Fir woods at the side I learnt by the waving of the trees & the uncommon murmur where I am accustomed to *delightful* "horror ac silentium" that a strong wind had risen ; when I got to the ridge with the intention of gaining the summit I found the wind so strong full against me from the N.E. that after tying my handkerchief over my hat & under my chin, every effort to get on was useless—when a leg was lifted I was almost blown back, you know by experience what is the power of the wind in such positions I therefore declined it—The mountain to the N.W. is very abrupt yet wishing to get to a somewhat less boisterous situation I looked out for the first break in the rocks where it might be at all practicable to get down & this I executed tho' not without some difficulty, tho' I had still more to make myself followed by a boy who carried a larger *vasculum* "parce qu'il n'y avoit point de *sentier* & qu'il n'avoit pas envie de se casser le cou" here I proceeded slowly, sometimes getting down a steep narrow pass securing my progress by laying hold of branches of *Crataegus Chamaemespilus* ! sometimes finding a narrow green place over the rocks, hence sliding myself down a crevice just sufficient to receive the body to get at another shelf &c &c &c in one of these crevices for the first time in the Jura I had the happiness of seeing *Cyathea montana* * . . . . . .' †

Still the Illustrationes Florae Helveticae did not progress, and the fact caused Davall much distress.

'Orbe 6th Decr 1793 ‡

'. . . . . . I very frequently reflect in certain gloomy moments which do but too often occur since my health has been so much disorder'd that You must necessarily (tho' from your goodness, delicacy, & friendship towards me you have kept silence on that head) tax me with inconsistency on account of the slow progress & non-execution of my long intend: work—I wish from my heart I *could* have done it as speedily as I ought—I have *many*, *many* reasons to wish notwithstanding the great impediments I have experienced hitherto from want of sufficient room to have my Plants & books in order—the incapacity of application by candlelight during the long winter evenings from the weakness of my eyes—the impossibility of keeping at home at a season when the delightful verdure of the country & my neighbouring mountains tempt me continually to ramble—the time employed in drying that I might advance my Herbarium . . . . . .'

Knowing Wyttenbach's former intimate friendship with Haller, Smith asked Davall for information concerning the great man. Some of these notes of Wyttenbach's, transmitted to Smith by Davall, were published by Lady Smith §. The following copy of a letter from Wyttenbach interspersed with Davall's notes remained unpublished.

(Enclosure to letter of 12 May 1794).

'Notes relating to Hallers Herbarium, Library &c ||.

'Copy of part of a letter from Mr Wyttenbach,

'J'ai été assez heureux de rencontrer l'autre jour Haller [jun.] que j'avois

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* *Cystopteris montana* Brnh.

† Linn. Soc., Smith MSS. 14, 196.

‡ Linn. Soc., Smith MSS. 14, 167.

§ *Memoir and Correspondence of the late Sir James Edward Smith*, London 1832, Vol. 2, p. 436.

|| Linn. Soc., Smith MSS. 14, 229.

cherché en vain plusieurs fois chez lui : comme il me disoit qu'il avoit 2 exemplaires des Planches de Dillen, je lui proposai d'en acheter un, ce qui a fait que je suis entré chez lui & que j'ai eu occasion de lui parler de la Bibliothèque de feu son Père.

'Elle a été vendue à Milan pour *2000* Louis & le transport de Berne à Milan a couté près de *500* Louis ce qui ne vous frappera pas quand vous saurez que tous les livres ont été emballés dans de petites caisses, pour les faire mettre sur des mulets, & que le tout a passé par le S^t Gothard. Le Gouvernement, (of Berne ED) auquel on a proposé l'achat de cette Bibliothèque, en a voulu faire une affaire de credit & de faveur, ce que les enfans de Haller n'ont pas voulu, & je ne les en blâme pas.—Tout le trésor immense du grand homme valoit bien par lui même d'être recherché, mais dans une République où chacun veut se faire valoir de son crédit pour s'en procurer chez d'autres, ces sortes de choses vont toujours misérablement mal. Le jour même que le contrat a été fait avec le Baron de Cronthal, si je ne me trompe pas, l'on a joué ce fameux feu d'artifice, qui, par les accessoires seulement a couté des sommes horribles, que l'on n'a pas regretté.

'Il n'y a pas eu des MSC. dans la Bibliothèque de Haller, au moins point de sa composition, car Haller faisoit valoir tous ses papiers, preuve en est l'edition même de sa correspondence *.

'Il faut cependant dire que l'exemplaire de son Historia Stirpium & celui de sa grande Physiologie, etoient remplis d'additions & de corrections. On a laissé le dernier entre les mains du D^r Triboleth † qui connoit très bien l'écriture infiniment mauvaise de Haller ; il devoit en tirer parti pour la seconde édition de cet ouvrage ; mais Triboleth, étant trop commode & n'aimant pas beaucoup le travail, (but above all things smoking his Pipe & visiting fine Ladies as gossiping Physician, ED. strange discordance !) l'a negligé, & je ne scais ce que le tout est devenu.—(I shall observe here that when in England young Jacquin mentioned a MSS. of Dick ‡ on *Rosa* that & other MSS. of Dick are in the hands of this same D Triboleth—he was intimate with Haller & was his Physician I believe & I have been told that on Hallers decline & even before when H. sent specimens to any Botanist ; Trib. took them from Haller's immense store & having permission to serve himself also, he has or has had in his possession most of Hallers rarer plants label'd as it were by Haller this might have been of great consequence in many cases in other hands but in his has hardly served any other end than to feed the larvae of Ptinus Fur, yet young Haller has told me he has procured from this D^r T. authentic specimens of most of the Carices.—) to continue

'Lorsque nous nous étions proposé de publier une seconde édition de l'Hist: Stirpium (they had published a Prospectus but the plan is now given up except that they are about reprinting the Plates with Text relating thereto & a new edition of the Préface with notes by Wyttenbach § who has written me different letters to ask me my opinion on several of Hallers names used *instead of specific names* in the notes to Preface such as—Odontites odorata ? (I answer—*Euphrasia viscosa*)—Avena arundinacea ? (Avena distichophylla). Juncus squamosus. (J. Jacquini) Sisymbrium coeruleum ? (Turritis coerulea All. ex loco natali) Helianthemum Ericae folio ? (Cistus Fumana).—&c &c &c. Some other of his Quaeres I have left to his own care as if answerd I should have precluded much of the information I have to offer—I assure you I blush in

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* The reference is to *Epistolarum ab eruditis vieis ad Alb. Hallerum scriptarum Pars* 1, Bernae 1774. Haller's correspondence remained in Berne.

† F. L. Tribolet published Vol. 3 of Haller's *Bibliotheca medicinae practicae* in 1779.

‡ Johann Jacob Dick (1742–1775) of Spiez ; pastor and botanist, tutor to Haller's children.

§ The reference is to *Alberti Halleri Icones Plantarum Helvetiae*, Bernae 1795.

thinking of my delay, & at the same time feel with my whole heart the weight of all I owe to your friendship.) but to get out of my perpetual Parentheses—when they had proposed publishing their 2^{d} edit of Hist. Stirp. " la Société Typographique a fait écrire à Milan pour avoir l'exemplaire de l'Auteur, mais l'on a fait tant de difficultés, des prétensions si ridicules que l'on y a renoncé : ce n'est cependant pas le Gouvernement qui nous a opposé tant d'obstacles : ce n'étoit apparement que les Dii minorum gentium.—

'Une anecdote qui je crois n'est pas connue—La Société Oeconomique de Berne n'avoit jamais été reconnue ni protégée par le Gouvernement, quand même l'on avoit souvent brigué cet appui public. Or après la mort de Haller, la Société arrangea une parentation publique (I don't know that word *parentation*, ? Parentalia antiquor.) à l'honneur de son Président, tout le Sénat, les Deux Cents, tout le public fut invité dans la Gallerie de la Bibliothèque publique : Tous les membres de la Société furent habillés en noir & firent les honneurs de la Fête. M^{r} Tscharner * Baillif d'Aubonne (rara avis inter Bernenses, as a man of solid learning, zealous Patron of science as far as was in his power Author of the *Dictionnaire Géographique Historique & Politique de la Suisse* now deceased ED.) recita son discours qui après a été imprimé.—Cela valut à la Soc. une très belle lettre de remerciemens de la part du Gouvernement qui l'encourageoit en même tems à continuer ses travaux pour le bien de la patrie. Ce fut le premier signe, la premiere marque de reconnoissance, témoigné à une Société qui pourtant jusque là avoit fait de bien belles choses & de très utiles à la Patrie. Nous fumes tous enchantés de ce témoignage & le primes pour un titre que le Gouvernement nous donnoit. Mais la Société depuis le décès de son grand President (Haller) s'est ressentie de sa perte, elle est tombée peu à peu en une Léthargie de laquelle elle ne se réveillera guères '.

One more blow now fell on Davall with results so discouraging that there was little hope of his writing his work.

'27 Jan 1796 †

'...... The want of sufficient room for my books, Herbarium &c drove me from a very small study which I formerly occupied & to which I was confined because a contiguous room which would have suited me—was appropriated to a much more important use the admittance of some card parties when another room more usually frequented could not suffice—I was therefore obliged during the latter part of the Reign of these accursed cards to take refuge in a less limited room *on the ground floor.*—not to be too prolix & to come to the point—I discover'd last summer that in this position from a certain degree of damp tho' not very great—my Herbarium has been in a great measure spoilt—a great number of specimens are become mouldy & among these some of the most precious. This miserable discovery affected me so deeply that really I have been incapable almost ever since.—......'

The letter continues with details which cannot be claimed as relevant to the history of botany, but which I should be sorry to omit, so poignantly are they told. Black markets, and the raising of the extraction-rate of flour are no novelty in Europe.

'When I look forward, I am lost in sadness.—the desolation of the times in which we live is fit also to inspire melancholy. it would seem (I wish I may be in error) that England is running headlong to her ruin—almost all I have is in the English Funds & I am not quite easy on that head.—This Country, as every other, is so affected by these disastrous wars that the price of every necessary of life is doubled & moreover we have almost to fear a Famine—had not the crop of Potatoes been very considerable (they are cultivated here in double the quantity they were 12 years ago) had not the Government procured a considerable provision of Rice from Turin we should I really believe have experienced all the Horrors of a Famine for the Armies on the Rhine together with some sort of collusion founded on private interest on the part of the Baslois I believe to supply the neighbouring French with Grain &c have prevented our having the usual provisions from Suabia ; as it is our bread is much inferiour to what it is in less miserable times & it has become necessary to husband the corn, to forbid all Bakers to admit to their Ovens every kind of delicacy made of fine flower &c &c &c. . . . . .

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* Vincent Bernhard von Tscharner (1728–1778).

† Linn. Soc., Smith MSS. 14, 196.

'The Armies on the Rhine ? & the cold procure us frequent visits from wolves, charming company, we have more than usual, last night one was seen in the Garden of a countryman at Montcherand a village very near us & plenty of their tracks about the Grotto of Montcherand of which you have a view. there are societies of 5 & 6 together—. . . . . .'

In spite of his youth, Davall's life was almost at an end. And although the political events in Europe isolated him more and more from England and his friend Smith, he had the consolation of the presence of a countryman during his last days. This man was Bracy Clark [*] whose presence in Switzerland at the time was not only remarkable in itself, since the French invaded the country while he was there, but was also of interest to the Linnean Society for a reason which will presently appear. His reasons for travelling at such troublous times were to visit a sister who had married and settled at Lausanne.

In Bracy Clark's first letter to Smith there are details about Davall.

'Lausanne December 4th 1797 [†]

'. . . . . . A few weeks since I was at Berne & saw there Prof. Wyttenbach, who was very particular in his Enquiries after you, he also informed me your friend Mr Davall of Orbe had suffered very much I think he said from a paralytic affection, he very obligingly gave me a letter to him & I hope to have the Pleasure of seeing him in a few days.

'Since my stay in this country I have discovered a very excellent & laborious Botanist, who has pursued the Plants of the Alps with uncommon ardour, he lives at Bex & his name may perhaps not be unknown to you, Schleicher [‡], his Collection which I have seen is immense if I can render you any assistance in this way I shall be happy in doing it, as his Communications may be had assez à bon marché. . . . . . '

'At Mons. James Jacques Secretan
Lausanne
Suisse.'

The next letter contains the information about Huber's MSS. which he had secured for the Society.

'Lausanne February 24th 1798 [§]

'Dear Sir

I hasten to inform you of a very valuable Prize I have been able to obtain for the use of the Linnean Society, & wish to consult you on the best mode of transmitting it to you with safety. It is a Dissertation [*] on the Natural History of the Humble Bees, by a Gentleman [†] of this place, his Researches have been made with so much adroitness & success, that but little is left to be wished for on this interesting subject . . . . . .

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[*] Bracy Clark (1771–1860), F.L.S., 15 Jan. 1793, veterinary surgeon—at his death the 'Father of the Linnean Society'. (*J. of Proc. Linn. Soc. Zool.* 6, 1862, p. xxi.)

[†] Linn. Soc., Smith MSS. 3, 126.

[‡] Jean-Christophe Schleicher (1768–1834) established at Bévieux the first botanic garden in the Pays de Vaud, and published catalogues of his plants for sale.

[§] Linn. Soc., Smith MSS. 3, 128.

' I am sorry I can give you no account of M^{r} Daval of Orbe at present. I propose seeing him as soon as the Snow is off the ground & the Roads become tolerably passible.

' Our Revolution [‡] here has happily passed hitherto without any Bloodshed, the English have however every one left Lausanne except myself at the first Moment of its Revolt as it was expected the Bernois would march in force to attack it. . . . . . '

Bracy Clark's next letters are dated from Orbe where he consented to stay upon seeing how ill Davall was. On 27 September 1798 [§] he wrote to say that Davall had died the previous day. He was 35.

Davall's fame as a botanist can hardly be claimed as great. And yet, in spite of the brevity of his life and the troublous times in which he lived, his name was well-enough known to figure in the accounts of travellers and in guide-books even after his death. His garden is specially referred to by Friederika Brun [‖] in 1801 and by C. G. Hölder [¶] in 1803, while Ebel [**] devoted a paragraph to it in his guide-book. There is a Rue Davall at Orbe today, but it is not clear whether it was named after him or his sons or grandsons, who played an honourable part in Swiss public life. It is interesting to note that Davall christened his younger son Charles Edward in honour of Linnaeus and of Smith [††].

Davall's house, on the east side of the steep and winding little Rue Davall, is now the parsonage. A fair sized stone building, it stands above and in front of its garden which extends down to the Rue de la Tournelle on each side of the Chemin de Ronde.

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[*] Mémoire sur les Bourdons ; published in Trans. Linn. Soc., vol. 6. It was read on 5 May 1801.

[†] Pierre Huber (1777–1840), entomologist of Geneva.

[‡] The French Revolutionary Armies had invaded Switzerland on 28 Jan. 1798.

[§] Linn. Soc., Smith MSS. 3, 134.

[‖] Friederika Brun, *Episoden aus Reisen durch das südliche Deutschland, die westliche Schweiz, Genf und Italien*, Zurich 1806, vol. 1, p. 165.

26 Oktober 1801.

' . . . . . . Drittens besuchten wir das Haus und den Garten des verstorbenen berühmten Botanikers Laval (sic). Hier erblickt man unter sich theilweise den Wasserfall der Orbe, die man denn vor sich im lieblichsten Contrast durch grünende Wiesen und malerische Baumgruppen sanft hinströhmen sieht. Gegen Osten ist die Aussicht in die feuchte Ebne, wo unter Yverdun der See die sinkende Tiefe füllt, und im Norden der weithingedehnte Jura seine bläulichrötlichen Haüpter erhebt, im schönsten landschaftstyl. Von der freyen Terrasse dieses künstlich über die Landstrasse in Arkaden geführten Gartens (den Laval aus einem Weinberg in einen botanischen Garten verwandelte) schaut man frey über das weite Land und an die Alpen hinan . . . . . . '

[¶] [Hölder, C. G.] *Meine Reise durch Wallis und Pays de Vaud. Im Jahr 1803*, Stuttgart 1805.

' Der Garten der Frau Davall ist ebenfalls sehr interessant ; hauptsächlich durch eine schöne Collection von Alpenpflanzen, worunter sich eine vollständige Sammlung aller Arten von Geranium befindet . . . . . . '

[**] Ebel, J. G. *Manuel du voyageur en Suisse*, Zurich 1811. Under ' Orbe ' :— M. *Davall*, gentilhomme anglois, mort a Orbe il y a quelques années, y cultivoit un beau jardin de plantes, et possédait une bibliothèque considerable . . . . . . '

[††] Linn. Soc., Smith MSS. 14, 204.

In composing the following tentative genealogical tree of Davall's family I have enjoyed the assistance of Dr. A. Ganguin. The last male Davall died in 1919.

From Davall's botanical colleagues in Switzerland there are eulogies by J. S. Wyttenbach * and Jean Gaudin †, and in England Smith was glad to refer to him as 'my worthy friend ‡', and as 'a most acute and intelligent

Edmund Davall died 5 April 1784 at Hatton St., London. Store-keeper in Navy Slop Office. Married 25 Dec. 1758. = *Charlotte Thomasset* died 1788

Louise-Marguerite Thomasset = *Victor-Frédéric Crinzos de Cottens*

Edmund Davall born Aug. 1763 in Parish of St. Andrew, Holborn; died 26 Sept. 1798 at Orbe. Botanist; married 4 Sept. 1789. = *Henriette-Louise-Stephanie Crinzos de Cottens* born 1762 at Orbe. died 1839.

Daughter; born 1790; died 1791.

Son, born and died 1792.

Edmond Davall born 25 March 1793 at Orbe; died 18 Dec. 1860 at Lausanne. Colonel, Forestry Inspector; married 25 Sept. 1820. = *Louise-Elizabeth-Henriette-Frédérique de Joffrey* born 12 Oct. 1800 at Vevey; died 6 March 1869.

Charles-Edouard Davall born 1795 at Orbe.

Albert Davall born 5 Sept. 1821; died 17 Sept. 1892. Forestry Inspector. His herbarium which contained plants collected by his father is preserved in the Musée Cantonal Botanique de Vaud.

Alfred Davall born 1830; died 1871. Lieutenant-Colonel, Inspector of Artillery.

Emile-Frédéric-Henri-Edmond Davall born 1835; died 1896. Lieutenant-Colonel of Artillery, in charge of Information Bureau for interned French Armée de l'Est, 1871. Deputy to Grand Conseil de Vaud, 1888–1893. Married 5 Sept. 1867. = *Charlotte-Sophie-Léonie Tavel* born 13 Sept. 1843 at Payerne; died 29 June 1868 at Lausanne without issue.

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* *Alberti von Haller, Icones Plantarum Helvetiae*, Bernae 1795, p. xxxv.

A multis jam abhinc annis Urbae moratur Cl. *Davall*, Anglus, qui dulci Florae amore ductus, non modo plantas regionis suae solertissime investigavit, sed et vicinos montes, ipsaque alpium juga conscendit, hortos suos magnis helveticarum civium copiis stipavit, plures dubiosas plantas ipsius Herbarii Linnaeani ope, Londini apud acutissimum *Eduardum Smithium* examini subjecti, enodavit & ad certas suas species, ad certa nomina retulit; plures suis impensis Londini quam elegantissime per optimum artificem *Sowerby* aeri incidi curavit. Multa eaque egregia huic Viro debemus, plura nova & *accuratissime* observata & fideliter descripta ante plures jam annos (1789) in schedulis ejus ipsi legimus, quaeque jam lucem vidissent, ni minus commoda valetudo Amici alias indefessi impedimento fuisset.

† *Flora Helvetica*, I. Gaudin, Turici 1833, Vol. 7, p. 583; Urba . . . . . .

. . . . . . celeberr. Davall, Anglus, Ed. Smithio amicissimus optimoque nostro Ducros coniunctissimus. Plantas in diversis regionibus, praesertim Helveticis collectas, singulari cura colebat, et ni fallor earum nonnullae superstites in isto horto, quam nunc eius digni possident filii, etiamnum Viri egregii solertiam testari, memoriamque tueri videntur.

Davall's sons here referred to were Edmond and Charles Edouard.

‡ *Sketch of a Tour on the Continent*, London 1793, Vol. 3, p. 158.

botanist, whose illustrations of Swiss plants, though left at his death, in 1798, in an incomplete state, may one day be found worthy of being communicated to the public '[*].

Davall had left his papers and herbarium to Smith, but there could be no question of sending them to England until Europe was at peace. The Peace of Amiens in 1802 provided the long-sought opportunity, and John White dealt with the business, for a letter from him to Smith gives details of payments made for customs duties [†].

A description of Davall's herbarium is given in a letter of W. F. Drake.

' DAVALL'S HERBARIUM [‡].

' *Extracted from a Letter of Mr. W. F. Drake of Norwich to Mr. C. Konig.*

' In answer to your enquiry respecting the late Mr. Davall's herbarium, now added to that of Dr. Smith, I can only say, that if you think the following particulars will be acceptable to the readers of the Annals of Botany, I shall feel myself very happy in being able to afford them.

' This collection of dried plants, weighing eleven *cwt.*, arrived here November 2, 1802, having passed through France during the short interval of peace. Besides Mr. Davall's own, it comprizes the entire Swiss collections of Reynier [§] and Favrod [‖], kept separately and distinctly.—That of Reynier is a regular collection of Swiss plants, arranged according to Haller, very deficient in *Cryptogamia*, but otherwise tolerably complete.—Favrod's is a bulky collection of plants indigenous to Switzerland, generally consisting of old specimens, comprizing many of each species and classed in natural orders.

' Mr. Davall's own herbarium was but imperfectly arranged ; the specimens loose (as in the others), but beautifully preserved, in exquisitely neat order, and very rich in rare and beautiful alpine plants ; some species extremely numerous. It is not entirely confined to Swiss plants, though chiefly to European ones. Mr. Davall had carefully arranged it after Linnaeus, but it is by no means complete, as far as that arrangement goes, as to number of species.

' There are besides vast stores of Swiss plants intended to have been placed in the herbarium, and various collections from Villars [¶], Bellardi [**], Ehrhart [††], and Dickson [‡‡], in which are found most of their described plants, as well as other treasures from Mr. Davall's numerous correspondents.

' Among the plants was observed an entirely new moss, of the genus *Gymnostomum*, discovered in Switzerland by Mr. Davall, to which Smith has given the name of *G. Davallianum.* The following specific character he has communicated to me, requesting that it may be inserted in your work, *G. caule brevissimo, foliis lanceolatis acuminatis carinatis patulis, capsula campanulata laevi, operculo hemisphaerico* '.

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[*] Rees' *Cyclopaedia*, Article ' Davallia '—

[†] Linn. Soc., Smith MSS. 26. 85, dated London, 2 Nov. 1802.

[‡] *Annals of Botany*, Vol. 1, 1805, p. 576.

[§] For Reynier, see p. 45.

[‖] The following information concerning Daniel-Moise Favrod (1742–1783) is given by J. S. Wyttenbach in his edition of *Alberti von Haller Icones Plantarum Helvetiae*, Berne 1795, preface, part of footnote which begins on p. xxxiv :—

Suas etiam laudes meretur beatus nunc *Favrod,* Castrodii Sanensium [Chateau d'Oex] olim Ludimagister, qui, ut ut rusticus, ardente plantarum amore ductus, & in Botanices scientia & in linguae latinae studio solus sibi dux & magister fuit, eôque tandem indefesso labore pervenit, ut non solum stirpes suorum montium *Hallero* notas eoque ducente, sibi familiares redderet ; sed etiam plures novas cives detegeret, & hortulum conderet, quem, ut inusitati & docti quid in illis regionibus, *latini* nomine populares insigniverunt. At morte praematura fato concessit Vir innocentiae morum & puris Florae deliciis unice inhians. (*Hopfners Mag. der Naturk, Helvet.* iv. 39. 40.) Herbarii ejus maximum partem emit Cl. *Davall,* atque ex illo vidit, Virum fuisse acuti ingenii, qui plantas bene examinaverit, qui e.gr. ante multos jam annos viderit, *Sonchum* nostrum non *alpinum Linnaei* esse posse, quique saepius optimas notas eaque perspicaces Herbario suo inseruerit.

[¶] Dominique Villars (1745–1815) of Grenoble.

[†] Carlo Antonio Ludovico Bellardi (1741–1828) of Turin.

[‡] Friedrich Ehrhart (1742–1795) of Herrenhaus.

[§] James Dickson (1738–1822), cryptogamist, of London.

Smith's own appreciation of the value of Davall's Herbarium is contained in the following letter:

'To Alex^{r} M^{c}Leay Esq^{r}, Sec. L. Soc.*

Norw^{h}, Jan. 12, 1805.

'Dear Sir

'Some mention of the Davallian Herb^{m} having recently appeared before the public by M^{r} Drake's communic^{n} to M^{r} Konig, perhaps a few more particulars, principally regarding the botanical history of Switzerland, may be entertaining to the gent^{n} of the Linn^{n} Soc^{y}, though not altogether proper to appear in print.

'This herbarium consists of 3 principal parts: the collections of Favrod, Reynier & Davall, all which considered together throw great light on the Swiss plants, & on the works of Haller.

'Favrod's plants are arranged according to the system of Haller, but have no names, as far as I can find, attached to any one, neither have they any place of growth mentioned. They are therefore merely a collection, very copious and well-chosen, of undoubted wild specimens of Swiss plants. Among them is a fine series, almost complete, of Haller's Mosses all numbered according to his *Historia.* Many of the other plants also have numbers referring to the same work, but they appear to be of no farther authority than as Favrod himself was able to determine them.

'Reynier's herbarium is a regular series of Swiss plants arranged, named & numbered, with the places of growth copied from Haller so generally that we are not sure of the specimens having been gathered in those places. Neither is this herbarium of any more original authority than the former. Reynier, a lively young man, sometimes fell into the strangest mistakes, either in deciding upon a particular plant of Haller, or in determining a species for himself. I regret not having found specimens of his own *Polytrichum pulverulentum*; but his authority in the *Cryptogamia* especially, will not be thought of great weight when I relate that he has preserved several starved spec^{ns} of *Draba verna* as a *Bryum* with pendulous heads, & has laboured to refer it to some described species. I find a vast collection of his manuscripts upon Swiss plants, written in his usual style, but I am not certain how far the study of them may repay the labour, if I should ever have time for the purpose. Besides this collection, I find a great number of plants collected by this industrious botanist in France, Holland, &c, with many garden specimens, named with less accuracy than ever I saw any before.

'M^{r} Davall's own collection is certainly of the greatest importance, not only for the extreme beauty variety & abundance of the specimens, whether collected by himself or his friends, but also for their authority. In every difficult case he consulted the son of the great Haller, as well as Prof^{r} La Chenal, M^{r} Wyttenbach of Berne, & M^{r} DuCros, & had specimens with their authority of almost every Swiss plant. He also went himself to the particular spots where Haller gathered his plants. He had from Villars fine specimens of all the rarest plants of Dauphiny. I find also an entire herbarium of that country, made, I believe, by a M^{r} Chaix, mentioned in the work of Villars. I only regret the defect of *Cryptogamia* in these collections from Dauphiny. Ehrhart, Allioni, Bellardi & Jacquin also sent M^{r} Davall many things, especially Ehrhart.

'How soon it will be practicable for me, without interfering with my other business, to digest the various manuscript remarks left by my deceased friend & to study with sufficient care this whole herbarium, so as to give any thing to the public, is more than I can now tell. Neither am I quite determined in what form to do it, whether as a series of notes upon Haller, in the order of his work, or as a *Flora Helvetica* in the Linnaean method. I am inclined to shrink from the latter task, as a *Flora* of this kind ought now to be very complete, while on the former plan I may communicate what I can, as far as it goes, without being responsible for what I am obliged to omit. There have also long been hopes of a Linnaean *Flora Helvetica* from the pen of Lachenal: see *Nova Acta Helvetica, vol.* I. 307.

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* Linn. Soc. Arch. This letter was read at the General Meeting of 15 January 1805.

'The corrections of the Linnaean synonyms in Haller's work, & indeed of many others, as he quoted much from memory, will be very considerable. On this subject M^{r} Davall & myself have for many years laboured in conjunction, & he always considered the materials he had collected as partly my property, for which reason, more especially, he wished them to come into my hands in case of my surviving him. He spent great part of the autumn & winter of 1788 in studying the Linn^{n} Herb^{m} with me for the express purpose of illustrating Haller's plants.

'I remain Dear Sir
Y^{r} very faithful h^{ble} serv^{t},
J. E. Smith.'

The bulk of Davall's herbarium was incorporated by Smith in his own, which is in the possession of the Linnean Society. When the Linnean Society dispersed its museum in 1863, sale-item no. 249 was 'Deal cabinet, containing part of the herbarium of the late M. E. Davall,' which sold for £1 0*s*. 0*d*.

Davall's books also came to Smith but by purchase, and a list of them is included below * with the prices which Smith paid for them, for a man's books are an intimate part of his biography, and bibliographers may be interested in the prices which they fetched in 1803. Most of them are now in the Library of the Linnean Society.

The most recent appearance of a reference to Davall in scientific literature is in a paper by A. Becherer †, describing the fate of the specimen of Diapensia lapponica gathered by Linnaeus and given by Smith to Davall. It will be remembered that the specimen was framed by Davall, and this must be why it did not find its way back to Smith with the remainder of Davall's plants

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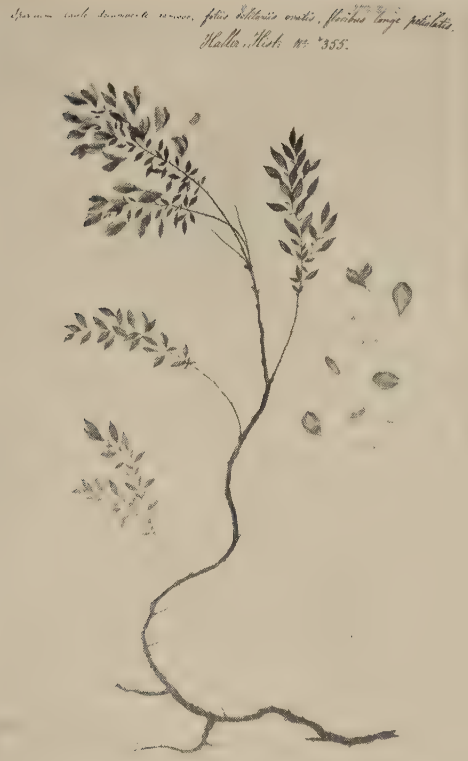
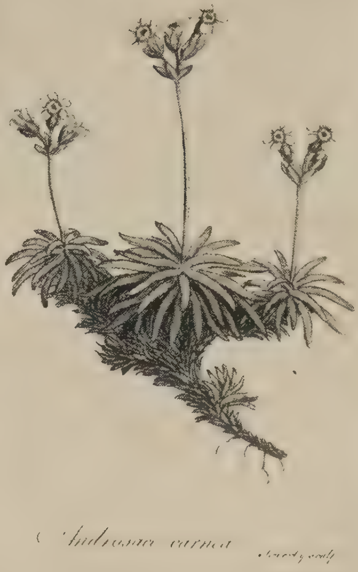
* Linn. Soc. Sm. MSS. 40, 3; Bartram's Travels 4*s*. 6*d*.; Botanical Analogy 1*s*. 0*d*.; Cantabrigia depicta 1*s*. 0*d*.; [Berkenhout] Clavis Anglica Linguae Botanicae 1*s*. 6*d*.; Curtis on British Grasses 1*s*. 0*d*.; De Borch sur les Truffles du Piemont 1*s*. 0*d*.; Description des Montagnes &c. 1*s*. 0*d*.; Dillenii Plantae circa Gissam Nascentium 4*s*. 6*d*.; Hagen Historia Lichenum 6*s*. 0*d*.; Haller Flora Jenensis 3*s*. 0*d*.; Halleri Nomenclator &c. 3*s*. 0*d*.; Halleri Nomenclator &c. 4*s*. 0*d*.; Haller's Memoirs by Henry 1*s*. 6*d*.; Burmanni Botanicum de Geraniis 1*s*. 0*d*.; Cappelerii Pilati Montis Hist: 3*s*. 6*d*.; Chatelain de Corallorhiza 6*d*.; Columnae Plantarum Historia 10*s*. 6*d*.; Darwin's Botanic Garden £1 2*s*. 0*d*.; Allioni Flora Pedemontana £2 9*s*. 0*d*.; Bulliard Herbier de la France £10 10*s*. 0*d*.; Catalogue of Trees &c. 10*s*. 6*d*.; Gunneri Flora Norvegica £1 1*s*. 0*d*.; Hedwig's Sammlung &c. 1*s*. 6*d*.; Hoffman des Lichens 1*s*. 6*d*.; Laicharding Vegetabilia Europaea 12*s*. 6*d*.; Armstrong's Health 2*s*. 0*d*.; Ellis's Hist: of Zoophytes £1 2*s*. 0*d*.; Hermannus de Rosa 1*s*. 0*d*.; Lamarck Dict: Botanique £5 5*s*. 0*d*.; Lamarck Hist: Naturelle £1 2*s*. 0*d*.; [La Chenal] Observationes Botanico-Medicae 6*d*.; Halleri Methodica Stirpium 12*s*. 0*d*.; Halleri &c. 10*s*. 6*d*.; Hedwig Stirpes £7 2*s*. 6*d*.; Heisteri Descriptio &c. 1*s*. 0*d*.; Hoffmanni Hist: Salicum 14*s*. 0*d*.; Roemer und Usteri Magazin 10*s*. 6*d*.; Roemer Neues Magazin 2*s*. 0*d*.; Roth Flora Germanica 10*s*. 6*d*.; Roth Beyträge zur Botanik 1*s*. 0*d*.; Schraderi Flora Germanica 1*s*. 0*d*.; Timm Florae Megalopolitanae [Prodromus] 1*s*. 0*d*.; Usteri Delectus Opusculorum 9*s*. 0*d*.; Usteri Annalen der Botanik £1 1*s*. 0*d*.; Willdenow's Prodromus 6*s*. 6*d*.; Willemet Plantes Etoilées 1*s*. 0*d*.; Scheuchzeri Agrostographia 5*s*. 0*d*.; Sepp's Insecta £1 7*s*. 0*d*.; Tode Fungi &c. 5*s*. 0*d*.; Retzii Observationes &c. £1 4*s*. 0*d*.; Rivini Intro: in Rem Herbariam £2 7*s*. 0*d*.; Swartz Icones Plantarum &c. 3*s*. 0*d*. [Also two items of which neither author nor title is given.]

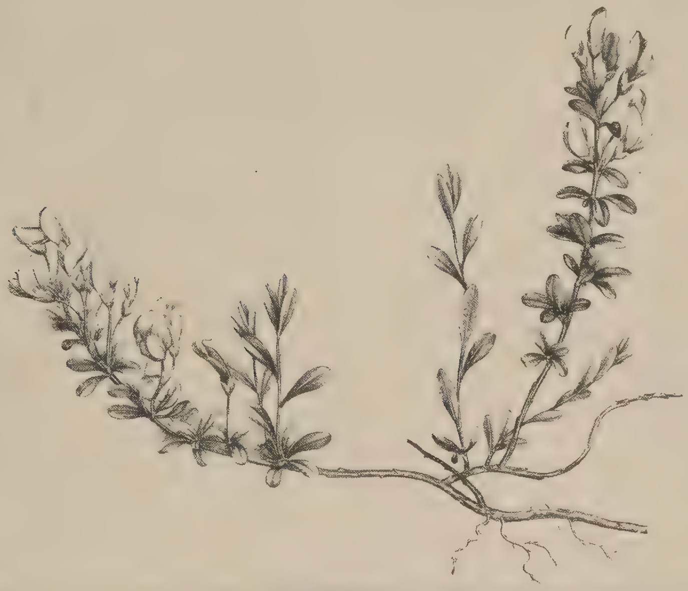
† Note sur deux documents Linnéens conservés à Genève, *Gesnerus*, 2, 1945.


Spartium caule decumbente ramoso, foliis solitariis ovatis, floribus longe petiolatis.
Haller. Hist: No. *355.

1



2

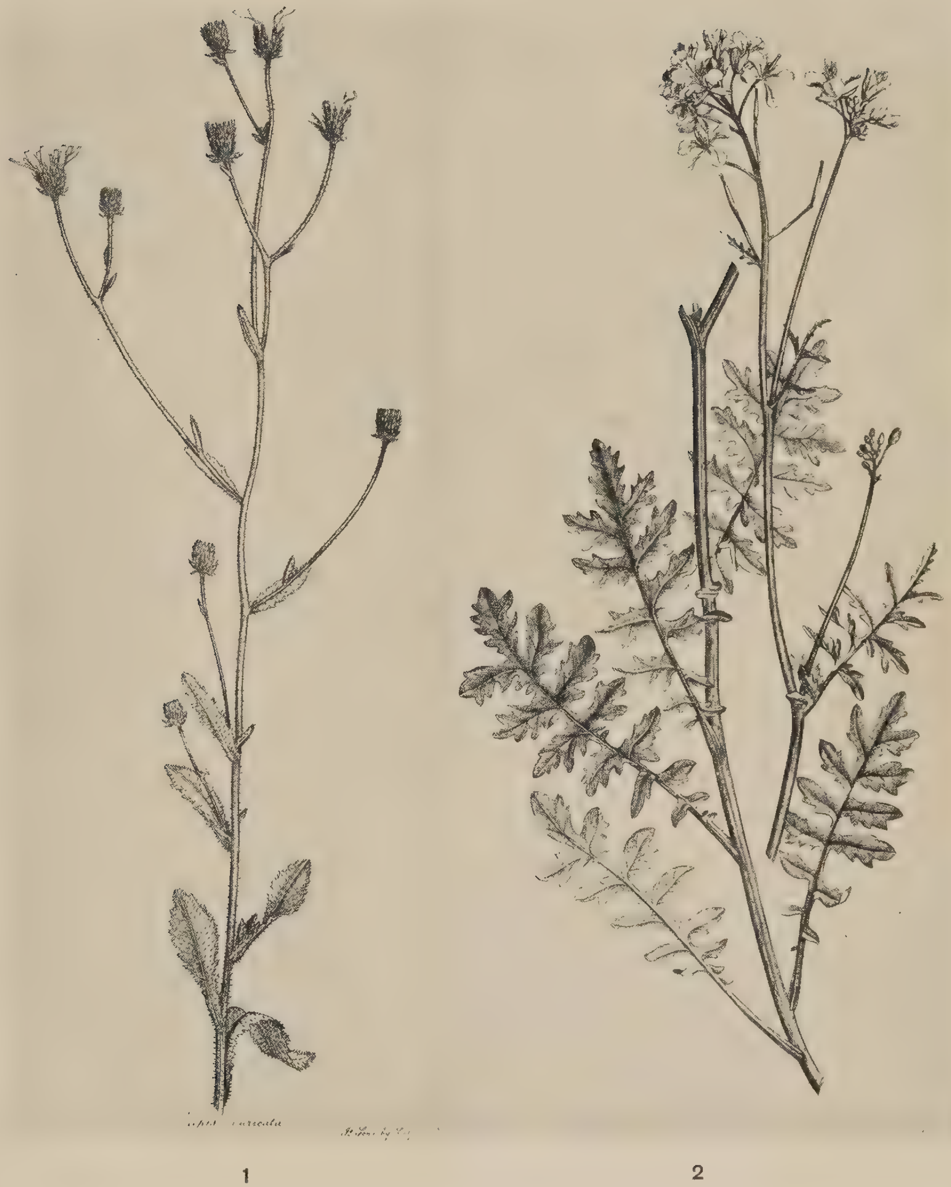


3

Edmund Davall's figures of

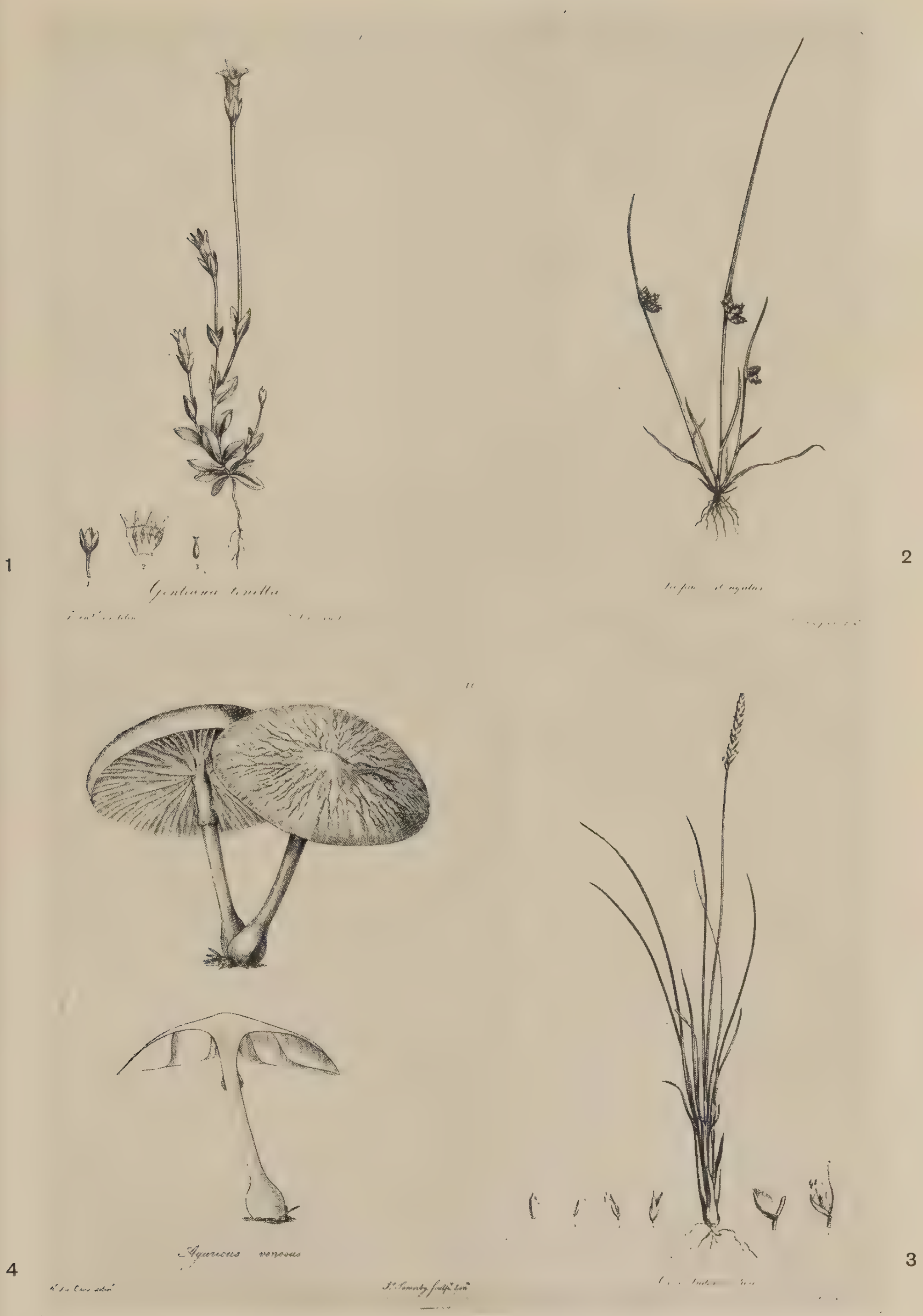
1. Spartium caule decumbente, etc. ('E. Davall pingi curavit 1786') (Cytisus decumbens) published by L. Reynier 1788 as 'Le Genet de Haller'.
2. Androsace carnea, and
3. Spartium decumbens, prepared in 1790.

2 and 3 engraved by J. Sowerby.



Edmund Davall's figures, prepared in 1790, of
1. Crepis muricata.
2. Sisymbrium obtusifolium.

Engraved by J. Sowerby.



Edmund Davall's figures, prepared in 1790, of
1. Gentiana tenella,
2. Scirpus elongatus (Fimbristylis dichotoma),
3. Carex Bellardi Allion. (Elyna spicata),
4. Agaricus venosus.

Drawn by F. Du Cros, engraved by J. Sowerby.

in his herbarium. It therefore passed to Davall's elder son Edmond Davall (1793–1860), Colonel in the Federal Army and Forestry Inspector of the Canton de Vaud, who left it to his son Albert Davall (1821–1892), botanist and forestry inspector. He left it to his friend Emile Burnat (1828–1920) of Nant sur Vevey, explorer of the flora of the Alpes Maritimes and Corsica, who left it to his son Jean Burnat (1872–1939), viticulturer. He left it to his friend Commandant Alfred Saint-Yves (1855–1933) of Vernon-sur-Brenne, Indre et Loire, France, botanist and colleague of Emile Burnat. Saint-Yves left the specimen to the Conservatoire Botanique de Genève, where it now reposes after its long journey.

After I had perused the Davall correspondence in the Smith papers and remembered that Davall's papers had all come to Smith, it occurred to me to ask Mr. S. Savage, F.L.S., the Librarian of the Society, if the plates with which Davall had hoped to illustrate his little work had been preserved. He immediately put his finger on a file of prints, the origin and significance of which were unknown, and among them were 8 of the 10 plates referred to by Davall (see Plates **1–3**). I have accordingly reproduced them here, a century and a half late it is true, but over his name as he had so much hoped to see them *.

PROCEEDINGS OF THE GENERAL MEETING ON 6 February 1947

Professor G. R. DE BEER, F.R.S., President,
in the Chair.

The Proceedings of the General Meetings held on Thursday, 23 January 1947, having been circulated, were taken as read and confirmed.

The President welcomed the presence at the Meeting of Professor H. Boschma, of Leiden, a Foreign Member, of Professor A. E. Trueman, F.R.S., President of the Geological Society ; and of the members of the Systematics Association.

The following were thanked for gifts made to the Library since the last Meeting :—Mr. C. T. Barnes and the Musée Océanographique de Monaco.

The President reported that he had written to the Swedish Ambassador expressing on the Society's behalf our profound sympathy with the Society's Honorary Member, HIS MAJESTY THE KING OF SWEDEN, in the death of His Royal Highness Prince Gustav Adolf.

The President called attention to a donation from the Swedish Academy of Sciences, Stockholm, of twelve silver medals, one struck in honour of Daniel Solander (1733–82), and eleven of Swedish botanists who had been Foreign Members of The Linnean Society of London.

The following Fellow signed the Obligation in the Roll and Charter Book, and was admitted a Fellow :—Dr. Herbert George Stubbings.

The President announced that it had been decided to award this year's Linnean Medal to Professor Maurice Caullery, F.M.L.S.

The following candidates were balloted for and elected as ordinary Associates, —Charles Burford Goodhart, B.A., Miss Joan Griffiths, M.Sc., Frederick John Taylor, B.Sc., and Arnold Swaffer

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* I wish to acknowledge the help which I have received in writing this article from Mr. Spencer Savage, F.L.S., Mr. A. J. Wilmott, F.L.S., Mr. M. R. Trappes-Lomax, Rouge Dragon Pursuivant, Dr. Rey of Vallorbe, M. Barbier of Orbe, Dr. A. Becherer of Geneva, M. P. Decollogny of Ste Croix, M. S. W. Poget of Morges, and Dr. A. Ganguin of Le Day, who also very kindly obtained information for me from Professor Maillefer of Lausanne.

A JOINT DISCUSSION, WITH THE SYSTEMATICS ASSOCIATION, ON THE TEACHING OF TAXONOMY.

The Discussion was opened by Sir CLIVE FORSTER-COOPER, F.R.S., Director of the British Museum (Natural History), who said that the growth of interest in taxonomy is a clear fact and is the result of modern needs.

After briefly reviewing some of the many aspects of systematics, with mention of some of the difficulties involved in their teaching, the necessity was stressed for consideration how the wealth of modern ideas could be brought together into a convenient teaching discipline and where and by whom it could be taught.

While the British Museum would not be in a position to undertake class work it would be able to receive a few students after they had obtained some preliminary teaching and give them opportunity of performing taxonomic work.

If it was decided that teaching of taxonomic principles was desirable and necessary in universities and schools the suggestion was made that it might be convenient to form a committee to draw up a preliminary syllabus of what ought to be included in the subject.

Professor JAMES GRAY said that he thought that it would be a great pity if taxonomists underrated the desire of University Departments of Zoology to teach taxonomy. As a teacher he greatly regretted the absence of sound taxonomic instruction ; he felt that a knowledge of the principles of classification was essential if students were to be given an adequate picture of the animal kingdom as a whole. It was also essential if students, not intending to become professional zoologists, were to be given an opportunity of continuing the subject as an intellectual hobby.

From the point of view of the elementary teacher, zoological taxonomy presented unusual difficulties, and he hoped that taxonomists would give guidance on how best the subject might be taught. He had found considerable difficulty in dealing with the systematics of common British animals ; different text-books adopted different classificatory systems without explaining the use of the terms employed. No doubt there were perfectly sound reasons for changing generic and specific names, but he felt that the task of an elementary teacher would always be extremely difficult in the case of any group whose nomenclature did not remain reasonably stable.

Professor Gray hoped that it would be possible for zoological taxonomists to draw up suggestions for the teaching of their subject, and consider the possibility of providing simple classificatory keys of the type available to students of botany.

Dr. W. B. TURRILL : It is widely acknowledged that there is a shortage of potential personnel for the relatively few posts in this country which have to be filled by those specially trained in plant taxonomy. There is, of course, a reciprocal cause and effect relationship here : there are few taxonomists because there are few taxonomic posts, while there are few taxonomic posts because there are few taxonomists and, perhaps more important, few persons with a taxonomic outlook amongst those who do or could stimulate botanical research. There are, however, two sets of problems, which though closely linked it is desirable for our present purpose to keep distinct : the teaching of taxonomy and the training of taxonomists. The latter is a most important matter and, if the present discussion prove of use and interest, fellows and members might desire that an evening should be devoted to it at a later date. Logically, it would appear that the teaching of taxonomy is a subject for discussion prior to the more specialized training of taxonomists and it is with this subject we are mainly concerned this evening. I submit that it is of the utmost importance that all students of botany should have such knowledge of taxonomy, its principles, aims, and methods, as would make them able to appreciate its basic importance to all other branches of botany and enable them to use to the best advantage the services provided by the specialist taxonomist, and, in return, to provide the taxonomist with data and materials to advance taxonomic research. The training of taxonomists as such should follow by selection from students with a good general knowledge of all branches of botany, including taxonomy. The best methods of making such selection offer interesting problems but these are better considered with the training of taxonomists.

This evening I limit my remarks to two aspects only and must of necessity treat them briefly. Firstly, to give the reasons why botanical taxonomy should be taught and, secondly, to suggest how it can best be taught. After careful consideration I see no reason for making any generalized distinction between teaching this subject in schools and teaching it in universities. Though there must be a difference in the extent and depth of the teaching many of the same general principles are valid whatever the grade of the student.

Some of the reasons why taxonomy should be taught may be stated very briefly. They are :

(1) It is the only branch of botany that is indispensable for the proper study of every other branch.

(2) It provides admirable material for training in observation, concentration, and record keeping.

(3) It can be made to balance extensively the intensive bias towards the over-use of ' type examples '. The great variety of form and the extent of combinations and permutations of characters can only be realized through wide taxonomic studies.

(4) The few professional taxonomists would be saved much time if more botanists were able to carry out a fair proportion of their own determinations and knew when it was and when it was not necessary to call for the help of the specialist.

These statements will appear as truisms to the taxonomist and possibly as merely dogmatic statements to the non-taxonomist. They will be explained and illustrated, and it is hoped justified, by our consideration of the actual teaching of taxonomy. The taxonomist so realizes the desirability of taxonomy being kept to the forefront in schools and colleges that, when this is not done, he suspects a cause is involved other than the relative value of subjects. It may be that taxonomy is a subject in which the teacher can be too easily caught out by his students, though, of course, that does not apply to any teacher here.

Before we turn to the problems of teaching taxonomy it may be well to call to mind the purposes taxonomy has to fulfil. These may be summed up as ' to put in orderly array the facts known about plants and animals '. In orthodox systematics this is done by : (1) establishing a hierarchy of classes based on combinations of characters ; (2) giving names to these classes ; (3) providing diagnoses, descriptions, keys, and illustrations to enable determinations to be made as precisely and quickly as possible.

The greatest interest of taxonomy is concerned with character combinations and their distribution. A taxonomic *character* is any structure or behaviour accepted as a ' distinctive mark ' for purposes of classification. The ' constancy ', i.e. the maintenance of the character under different environmental conditions, the combinations of characters, their correlation, and their distribution in space and time, link taxonomy directly with ecology, phytogeography, cytogenetics, phylogeny, and palaeontology, not only as a servant of these but also as a partner.

We come now to the actual teaching of taxonomy. My own experience, both as student and teacher, is that practice and theory should be combined almost from the beginning. ' What is this ? ' usually means ' What is the name of the class to which this belongs ? ' The student must learn how to determine classes and how to allocate individuals to classes. Starting with the simpler floras he should learn the best way of using keys, diagnoses, descriptions, and illustrations for purposes of determination. He should then learn, by actual practice, the two advantages of determination : that it enables what is known about the class (most often species) to be traced most easily, and, conversely, that it enables discoveries to be made accessible to all able to use them. By determination, followed by investigation in a herbarium and library, the student will soon learn the practical value of names and of a stable nomenclature. There is no need to labour the point that such training has application far outside the field of biology.

I have preferred the word ' determination ' to ' identification '. If the latter be used the student must clearly understand that no two specimens are altogether identical. They are identical only in the sense of showing characters within those accepted for the class-limits and may thus for certain purposes, and for certain purposes only, be treated as the same. Whatever degree of objectivity classes may have does not alter the fact that a determination is made subjectively and does not prove any inherent identities.

In order that the student should understand what is involved in determination it must be explained that material to be determined has to be carefully studied and as many as reasonably possible of its characters worked out. This must be done by preparing orderly descriptions with emphasis on what are thought to be the essentials of structure and behaviour. A description must follow a conventional (though sufficiently elastic) scheme with the organs and functions described in a rational sequence. Drawings and measurements are frequently essential and a pocket lens and dissecting microscope must be fully used. Plenty of practice in dissection and in interpreting the results of dissection has the double advantage of establishing and increasing interest and in laying a solid foundation for discussion on the principles of classification. Quite early a student should be taught how to use preserved material to the best advantage : both material preserved in liquid and as dried herbarium sheets. The boiling up, or otherwise softening, of dried materials and their use for studies at any time form a good means for introducing the comparative study which is basic to taxonomy. Modern plant taxonomy, however, is expanding to include data from all other fields of botany. In particular, the student should have practice in the utilization of distributional data, starting with the simple sorting of material on a geographical and a habitat basis. The value and limitations of cytological data and the insight into the nature and behaviour of ' characters ' often given by genetical studies can gradually be explained. Many students will find that experimental taxonomy opens up fields whose exploration appears so fascinating that the taxonomic goal must be kept in view to prevent wanderings down the many delectable by-paths. May I here also put in a plea for the introduction of statistical methods in an early stage of taxonomic teaching ? These need not be of the highly complicated type but should include a practical understanding of mean, mode, medium, standard deviation, standard error, and correlation. The student should also be encouraged to devise new or modified statistical tools for solving special problems.

I have said nothing about phylogeny. So far as the majority of plant groups are concerned (there are some exceptions), this is a very controversial and exceedingly difficult subject, partly because of the meagre nature of relevant palaeontological data. I also know that some of my views on phylogeny are still regarded as heterodox if not heretical by some of my colleagues. I fully recognize that phylogenetic hypotheses are extremely convenient for grouping together what may otherwise be isolated facts, that they stimulate interest, and that they save the teacher much trouble. All this may be to the good, but the danger is that what starts as a working hypothesis tends to become accepted without criticism as an established dogma and, from the working of well-known psychological principles, the earlier in a human life-history a dogma is instilled the more dogmatic does it become. I would, therefore, in the teaching of taxonomy, introduce phylogeny at a relatively late stage after a good and independent foundation has been laid along the lines already mentioned. I quite expect disagreement on this matter and shall welcome valid counter-arguments.

We can pass to a brief reference to the teaching of the principles of taxonomy as a part of the philosophy underlying the classification of organisms. This, in my opinion, should be in two stages. At first principles should be indicated through concrete examples as these are met with in actual practice. When the student is acquainted with sufficient factual data he should be helped to grasp the total of underlying principles and generalizations and aided in giving them logical form, and perhaps this can best be done as an introduction to a final course. To dictate 'rules of the game' cannot be justified either pedagogically or botanically in the teaching of taxonomy. When the student has had a good deal of practice in taxonomy and has attained an appreciation of the general principles of the subject he should learn something of its history. I am not inclined to the view that the historical method from the beginning is the most desirable because so much would have to be learnt and then discarded, except for its position in history, and because it does not sufficiently stress the need for the student to work out problems for himself by means of specimens and instruments.

There are many aspects of the teaching of taxonomy I have neglected in these short comments. The main points I have tried to make can be very concisely summed up. Taxonomy is basic to all biological investigation because such is often not merely useless but misleading unless the material on which it is based is precisely determined. Its methods and principles should, therefore, be introduced at an early stage in the teaching of botany and it should be kept to the forefront throughout the period of botanical tuition. The best method of teaching is in practice. Students must get out into field and garden, must collect, handle and dissect, and record their findings for actual specimens which they must learn to classify and determine. They should continue in the laboratory, the herbarium, museum, and library their studies on characters, character-correlations, and all the biological data which can now be incorporated in taxonomy. They must again and again get out into field and garden, and directly or through ecology or other subjects, must find their own taxonomic problems and collect their own materials. In brief, there are decided limits to the possibilities of the direct adequate teaching of taxonomy, but the student can and should be taught to teach himself taxonomy.

Dr. H. Boschma, F.M.L.S., expressed his thanks for the President's kind words of welcome. He gave a short account of teaching of systematic zoology and training of specialists in this branch of science at Leiden University. Here the students pass two examinations. For the first they have lectures and general courses in zoology, botany, geology, physics and chemistry. Compulsory for all the students in biology are lectures on systematics of animals (with a general morphological basis) and an elementary practical course of one afternoon each week during their second year. Here they learn to identify animals on material which lends itself for studies by beginners. In this course we use representatives of the Netherlands fauna: mollusca, fishes, echinoderms, hydroids, the higher crustaceans, water-mites, Polyzoa, etc.

After their first examination all the students in biology have to follow lectures in systematic zoology on various subjects, e.g. the systematic principles as illustrated in a certain group of animals, the rules of zoological nomenclature, the species problem, etc. As far as concerns the practical work in zoology for their second examination they can make a choice from several subjects: comparative anatomy, physiology, ethology, applied entomology, etc., or systematic zoology. This is where the training of systematists begins, if really it may be called a training. This training largely consists of cases of trial and error. The students receive museum material of a certain group of animals which seems to promise results of scientific value, and get some help to find the chief literature to start with. At first they meet with very little success, but as a rule they gradually find out how to tackle their problem and develop themselves into good systematists. As a rule only those students who have an inborn capacity for systematic work choose this as their practical work for the second examination, so that in practice the system meets with good results.

Generally the work of these students yields rather extensive results, so that after their second examination they continue their studies on the material, resulting into a dissertation for the degree of doctor of science.

So after the first examination the student may, as far as concerns zoology, in his practical work restrict himself entirely to the study of systematic zoology, and obtain his doctor's degree on a subject of pure systematic zoology.

The system may have its disadvantages as one can hardly speak of training of systematists, but the result is that a sufficient number of systematists are developing themselves to fill the posts where they are needed.

Dr. P. W. RICHARDS: Few probably really disagree with the view that all students of biology, wherever their interests may ultimately lie, should have some knowledge and understanding of taxonomy, but, in my opinion, it is less the findings of taxonomy than its principles and methods that need to be taught. The not always undeserved reputation of taxonomy as a dull subject is due, I think, partly to an attempt to teach the results of taxonomy rather than taxonomy as a living branch of research, and partly to academic teaching being too much concerned with the families and larger taxonomic units rather than with species and intra-specific units. To the student with his very limited experience of plants in the field the characters of this family or that are a very abstract conception, while a careful study of the characters of a single species or small group of species with which he is already to some extent acquainted will teach him much and will show him how much there is yet to be found out about apparently quite familiar things.

To illustrate one method by which this can be done I should like to describe an experiment in teaching taxonomy which has been tried at Cambridge by Mr. Gilbert-Carter, Dr. Godwin and myself during the last few years, an experiment which has been, I think, very successful. Those of our students who are about to take the Part 2 (Advanced) course in Botany attend a Long Vacation course during the previous July and first half of August. During this course each student (or if the class is large, each pair of students) makes a thorough study of the taxonomy of a single variable species or of two or three closely related species, in the field, the laboratory and the herbarium. During the following term they are invited to read a short paper on their results to a seminar. Material for study is collected round Cambridge during the organized Long Vacation excursions and at other times. Many of the keener students continue the work at home after the end of the Long Vacation course. Each week, while they are still at Cambridge, Mr. Carter, Dr. Godwin and myself are available at particular times to discuss the progress of the work, to make suggestions and to guide the students to sources of information such as the chief British and Continental floras, works on geographical distribution, monographs and specialized papers, etc. Some students find their work develops along biological or ecological lines, others keep within the limits of more orthodox taxonomy. Several of our students have obtained results of very great interest even in the short time available and for some their Long Vacation studies have been the beginning of serious research. Very few even of what I may call the hard-bitten physiologists have failed to have their interest aroused and all have profited from their work. I think myself they have obtained more insight into the real nature of taxonomy than they could have done from any number of lectures on the Lardizabalaceae or Ranunculaceae.

There are two other points I should like to make very briefly. The first is that the teaching of taxonomic botany should not always draw its material, as it generally does, solely from the flowering plants. Other groups of plants, for instance, the mosses and liverworts, provide excellent material, available at any time of year, for the teaching of taxonomy. My last point is that in the teaching of taxonomy there is a great need for a good text-book. We have several text-books on the families of flowering plants but no text-book, as I understand it, of plant taxonomy. Dr. Bisby's excellent *Introduction to the taxonomy and nomenclature of the fungi* is the kind of book I have in mind. What is wanted is a book like this covering the whole field of plant taxonomy. If the Systematics Association could initiate or encourage the writing of such a book, it would, in my opinion, do a most valuable service to the teaching of taxonomy.

Dr. A. E. TRUEMAN, President of the Geological Society, said that although the problems involved in the naming of fossils were in some respects different from those facing the neontologist, the palaeontologist was keenly interested in the teaching of taxonomy. Probably instruction in taxonomy had remained as a more usual component of palaeontological than of biological training, for most students of geology learned a little palaeontology in order to identify fossils as guides in stratigraphical work. There had been changes in practice. About forty years ago a committee of the British Association produced lists of fossil species which it was appropriate that students of particular grades should know ; it was not surprising that few of those names were now in use, or applicable to the common fossils which had been so named. But the palaeontologist had not only to face nomenclatural problems arising from applications of rules and from subdivisions of the older genera, he also was forced to recognize the impossibility of a palaeontologist being able to cope successfully with the fossil remains of the enormous numbers of separate time planes from the Palaeozoic to the present : in short, to accept the fact that the geologist could only identify at sight the faunas of limited rock groups. Added to that, many palaeontologists were inclined to doubt whether the binomial system could be suitably applied to some groups of fossils.

In the teaching of taxonomy to palaeontologists it was generally recognized that different tactics were necessary at the various stages of study. Beginners may follow courses in which they are taught to distinguish forms belonging to different families : they may know these by their generic (or even specific) names, or by the names incorrectly given to them in some text-books. At an early stage, moreover, they are frequently encouraged to collect specimens for themselves, in quantities so that the ranges of variation may begin to have some significance. There are few simple guides to identifications ; monographs are too few to allow a student to make much progress except in limited groups. At subsequent stages progress is only possible to the specialist, with the guidance of experts in particular groups, and there are too few specialists to make this type of training available in many centres.

Prof. A. G. TANSLEY desired to underline Dr. P. W. Richards's remark that it was better to begin with the smaller taxonomic units such as species, subspecies, varieties, etc., than with the larger ones such as families and orders. He himself had experienced the disadvantages of lecturing to elementary students on the characters of abstract conceptions such as families. He thought that taxonomic training, up to a point, was most desirable for all students of botany, and that they should begin by collecting plants in the field, especially allied species belonging to particular genera, making thorough examinations, descriptions and comparisons, and gradually learning which were the characters of taxonomic importance. Later they could deal with generic and then with family characters and differences. Only by constantly handling specimens and dealing first with the most concrete units could students build up a real first-hand knowledge of taxonomic principles.

Dr. S. P. WILTSHIRE : My approach to this subject is from the somewhat narrow point of view of a worker in an applied science who has felt the need of more teaching of taxonomy in his particular subject. As a plant pathologist I have to deal with newly trained men, straight from the University. One of the functions of the Imperial Mycological Institute is to identify fungi sent in by plant pathologists from all parts of the Empire, notably our Colonial Dependencies. We are in close touch therefore with plant pathologists overseas and the Colonial Office arranges for all new recruits to visit the Institute before proceeding to take up their posts abroad. It has been our experience that fully trained men have sometimes never seen the inside of a herbarium packet, never used lactic acid as a mounting medium for microscopic preparations, and never heard of the International Rules of Botanical Nomenclature. In fact, while they had a knowledge of different types of fungi, they had no precise knowledge of what is involved in identifying one, and furthermore, did not know what data to provide for the systematist at home to help him in identification. Now I can scarcely believe that any University teacher will regard such a state of affairs as satisfactory. I do not expect junior plant pathologists to have an extensive knowledge of systematics, but we should like them to have a working knowledge of how to set about the identification of a fungus. I do not wish to depreciate in any way the excellent mycological work being done at some of our Universities nor do I wish to underrate the thorough background given in graduate courses, but I do wish to point out a deficiency in post-graduate plant pathological training that has existed for some time and which I hope may be remedied. When I have on occasion pointed out this deficiency I have been told that it is impossible for Universities to provide post-graduate training in specialized subjects required by only a few students. If it is impracticable to provide post-graduate courses in systematic mycology at any one university, I hope it may prove feasible to have a course somewhere which students from other Universities may attend.

Secondly, I should like to emphasize the importance of correct identification to the literature of plant pathology, as it provides the key to open the world's literature on any particular disease. Some years ago we had a request from Canada for material of *Didymella applanata*, a raspberry disease not then reported from North America. We demurred at sending the material until we had the sanction of the Dominion Botanist, but when it was sent it was then found that the European disease was identical with one already well known in North America but attributed there to *Mycospherella rubina*. This identification made the literature in each continent available to the other.

Before the war a series of physiological studies reported from Germany on *Cladosporium fulvum*, a serious tomato disease, was ultimately shown to have been carried out on *Trichothecium roseum*, a species which is hardly a parasite at all and is virtually harmless to tomatoes. Recently again we have had an announcement by one of the world's foremost research workers on fungicides that one of the test fungi he used throughout his many studies was wrongly named. And to mention only one more case, early American literature abounds in official references to *Sclerotinia fructigena*, which is now known not to exist in that continent. I think these instances serve to show that plant pathology can with great advantage become more taxonomically minded.

Mr. A. J. WILMOTT said that whilst the continual alteration of names of species was apt to be regarded as a hindrance to the learning of systematics, he thought that if the reasons for changes were thoroughly investigated so that they could be simply explained, a great deal would be learnt about the basic principles of systematics. He would find that individuals (specimens), species, names, definitions, descriptions, types, and so on, were things of definite nature, which could do certain things (i.e. which performed certain functions) and with which certain things could be done—the tools, so to speak, of systematics. It was the nature of these tools, their relations and uses, that formed the basis of systematic work, and this needed to be taught.

Professor I. MANTON : The problems involved in teaching taxonomy in the provinces are somewhat different from those of places in which the great national collections are at one's elbow. As I see it there are three things involved. The students' interest must first be aroused. This can be done by any good teacher in a great variety of ways ; my own interest was first aroused by attending Professor Chodat's very excellent course of lectures on the plant geography of the Alps and the history of the Swiss flora given at the vacation course at Bourg St. Pierre by the University of Geneva. Then a student must get to know his plants. This can often be done very well in the provinces for we are close to the country and in Leeds we use the Ecology Report for this purpose. This consists of a written ecological description of a piece of ground which every student is expected to do in the long vacation of the second year, preparation for it having been given by courses on taxonomy and ecology, given in the preceding summer term, followed by a week's field work. The Report has to be handed in at the end of the first term of the following academic year and is an integral part of the degree. It works well in practice and we do find that students learn the elements of identification of Fungi, Bryophytes and Flowering Plants by means of it. The third requisite, namely the rudiments of herbarium practice is much more difficult to provide. There does appear to be a field of botanical technique involving botanical description, the use of dried material, the way to handle large numbers of specimens by statistical methods, etc. in which some undergraduate training could profitably be given if university staffs had ever themselves been instructed. The suggestion is offered to the consideration of the Linnean Society and the Systematics Association that a vacation course for University Staffs of a week or fortnight's duration should be sponsored by them at some suitably equipped central place, elementary instruction in herbarium and other methods of taxonomy perhaps being combined with elementary instruction in the more easily applied cytological and anatomical methods which are becoming increasingly required by systematists.

Dr. O. W. RICHARDS : Speaking as an entomologist and as a member of London University, I believe that the two steps which would do most to benefit the teaching of taxonomy would be to put some working taxonomists on the staff of the teaching departments and freely to admit taxonomic researches as the subject matter for higher degree theses.

The PRESIDENT stated that he was not sure of his ability to act as ' question-master ' in summing up the discussion of this Brains Trust but he would like to emphasize the importance of a due regard for Taxonomy from the point of view of that aspect of Zoology with which he was most closely associated namely, Embryology. Recent experimental work has shown that what was previously thought to be a very important principle of development, namely, the ability of certain synthetic hydrocarbons to induce the formation of axial structures of an embryo, has been found by experiments on material of a different species to require a very different explanation. It so happens that the tissues of the species first worked upon were highly susceptible to saline solution which produces cytolysis, and it is probably to cytolysis that the effects of the synthetic hydrocarbons were previously due.

He would like to re-enforce what was said by Professor James Gray regarding the lamentable situation in which a Professor of Zoology or Embryology finds himself when confronted with a specimen and is asked to identify it. On all sides the importance of Taxonomy was now recognized and he drew attention to the curious change which had taken place during the past century and a half. When this Society was founded, only ten years after the death of Linnaeus, the main aim in Biology was considered to be classification and nomenclature.

Since that date other and very important disciplines had arisen and almost completely excluded the study of Taxonomy, particularly from academic curricula. He was fully alive to the importance of a suggestion made by Dr. O. W. Richards that the Universities should recognize the importance of Taxonomic studies both in the appointment of their Staff and in their examination papers. He would also like to support what Professor Manton had said in regard to practical steps to be taken for the wider teaching of Taxonomy. He would like further to assure her and all present that the Linnean Society would not wish to avoid responsibility in bringing this about ; and since Sir Clive Forster-Cooper had said that the difficulties in the way of the assumption of responsibility for teaching Taxonomy by the Staff of the British Museum included the lack of a suitable lecture room, he was empowered to say that the Linnean Society wished to offer every form of co-operation that lay in its power; for instance, he would like to offer the use of the Meeting Room of the Linnean Society for such instruction as could be given in it, and drew attention to the facilities which the Linnean Society possessed of demonstrating to students specimens and books of classical Taxonomic importance.

He concluded by thanking all those who had taken part in the discussion and had braved the weather to come and contribute to so successful a meeting.

PROCEEDINGS OF THE GENERAL MEETING ON 20 February 1947

Professor G. R. de Beer F.R.S., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 6 February 1947, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last Meeting :—Mr. F. Børgesen, Professor S. W. Geiser, Professor C. T. Ingold, the Royal University, Uppsala, and the Association of Bird Watchers and Wardens.

The following Fellow signed the Obligation in the Roll and Charter Book, and was Admitted a Fellow :—Dr. Laurence Chalk.

The President reported the deaths of Dr. Hans Driesch, F.M.L.S., and Professor Robert Newstead, F.R.S., an Associate of the Society.

The following communications were read and discussed :—

Mr. S. Savage. An early 18th century physician's botanical manuscript. [Exhibit.] (Discussed by Mr. A. J. Wilmott, Mr. W. T. Stearn and the President.)

Abstract.—

The MS. exhibited had been through one of the London air raids ; and was one of the items in the library of the late Mr. Francis Druce, F.L.S., rescued by Mr. A. J. Wilmott after the block of flats had received a direct hit, followed by a fire, in 1941 ; in the same incident in which unfortunately Mr. Druce lost his life.

The cutting from a bookseller's catalogue, still with the MS., calls it an 18th century Botanical MS. 2 vols., but with no attempt at attributing it to anyone.

The MS. consists of drawings, brief descriptions and habitats of British plants, arranged according to a modification of Ray's system. The latest authority cited is Ray. Some of the descriptions are taken, more or less word for word, from the second edition of Gerard's 'Herbal', and some of the habitats from Ray's 'Synopsis', ed. 3 (1724). The text is in English. The earlier part of the MS. is probably missing, as the classification begins with part of 'Genus the Twelfth'.

The internal evidence gave no clue to the authorship. There were, however, several fragments of MS. loosely inserted in the MS. ; and it was from these that a clue was found. Several of these fragments make up part of a bill 'Mr Nickols Dr . . . January 1733 . . .', on the versos of which are some botanical drafts by the writer of the MS.

In 'Rees's Cyclopaedia', I found a biographical notice of Frank Nicholls ; and, from a reference to his botanical interests, was led to trace some documents in his handwriting in the archives of the Royal Society. As those documents are in the same handwriting as that of this botanical MS., there can be no doubt that this was written by Frank Nicholls, M.D., F.R.S., at some date between about 1733 and 1762, the date of Hudson's 'Flora Anglica'; for there is but little doubt that Dr. Nicholls would have bought that work as soon as it appeared.

Frank Nicholls, M.D., F.R.S., of Cornish parentage, was born in London in 1699 ; his father a barrister. Educated at Westminster School, he went to Exeter College, Oxford, in 1714. Before obtaining his M.D. degree in 1729, he had lectured at Oxford on minute anatomy. Afterwards he had a distinguished career as a physician, becoming a lecturer at the Royal College of Physicians, 1734 and 1736, and 1748–49. He delivered the Harveian Oration in 1739. He was elected F.R.S. in 1728. On Sir Hans Sloane's death in 1753, he was appointed physician to George II, and examined him after his death. He married a daughter of Dr. Richard Mead, F.R.S. Of five children, a son and a daughter survived ; the son becoming a barrister and M.P. Dr. Nicholls lived in Oxford in 1762, whilst his son was at the University ; later, when his son was studying Law in London, he moved to Epsom, Surrey, and died there, 7 January 1778, in his eightieth year.

This botanical MS. is of interest as showing how an English physician dealt with British botany during the early part of a life that coincided nearly with that of Linnaeus, who also died in January 1778.

From the 'Life of William Curtis', by Mr. Hugh Curtis, 1941, it is evident that Dr. Nicholls corresponded with William Curtis in 1775 on botanical matters.

An engraved portrait of Dr. Nicholls exists as the frontispiece of the biography his friend Dr. Thomas Lawrence published in 1780; in which book will be found a full account of Dr. Nicholls's contributions to medical science.

Mr. W. T. Stearn. The nomenclature and synonomy of *Tofieldia calyculata* and *T. pusilla*. (Discussed by Mr. A. J. Wilmott and the President.) [This paper will be printed in full in the Journal, Botany.]

Abstract.—

The name *Anthericum calyculatum* of Linnaeus, Species Planterum (1753), covered four species but was primarily based upon the Central European species to which authors since 1812 have restricted the name *Tofieldia calyculata* (L.) Wahlenb. The name *T. palustris* Huds. as first published in 1778 must be regarded as a synonym of *T. calyculata*, even though it has been restricted by later authors to the circumpolar Arctic-Alpine species which alone occurs in Britain. For this the correct name is *T. pusilla* (Michx.) Pers. Linnaeus knew both species in a living state, having met with *T. pusilla* in Lapland in 1732 and *T. calyculata* in Gotland in 1741; but he did not consider them specifically distinct. The paper summarizes the distinguishing features, history, synonymy and geographical distribution of the two species.

Mr. I. H. Burkill. A plea for a description from life of the African *Dioscorea minutiflora* Engl. (Discussed by Mr. P. R. O. Bally, Dr. J. Ramsbottom, Prof. A. C. Hardy and the President; Mr. Burkill replied.) [Printed in full below.]

Professor A. C. Hardy, F.R.S. Insect populations of the upper air. (Discussed by the President, Mr. A. J. Wilmott, Professor G. D. Hale Carpenter, Dr. J. Ramsbottom, Dr. Edward Hindle, Mr. F. C. Grigg, Dr. B. Barnes, Mr. I. H. Burkill, Mr. H. R. Hewer and the President.)

Abstract.—

By sending up closed nets (like marine plankton tow-nets) attached to kites, automatically opening them at any desired height and closing them again before hauling them down, the constitution and quantities of insect populations carried by aerial currents at different heights up to 2000 feet have been investigated and correlated with conditions of temperature and humidity. These results (Hardy and Milne, ' Journal of Animal Ecology ', vol. 7, pp. 199–229, 1938) were discussed as an introduction to an account of as yet unpublished researches into the distances which members of this ' aerial plankton ' may be carried under different conditions. With the co-operation of a number of steamship lines crossing the North Sea on different routes, the air covering a large tract of the sea, at least a hundred miles from land, was surveyed for insect life by nets flows from the mast head; these were hauled up when the ship had steamed a hundred miles from our coast and hauled down again on reaching a point a hundred miles from the Continent and vice versa. A smaller area 50 miles from land was also sampled for comparison. It is shown that this country must, at frequent intervals in the summer, be invaded by large numbers of small insects carried by the wind; some of these are important agricultural pests. With the help of the Air Ministry the path taken by the various air masses and their rates of movement have been determined to show the probable countries of origin of the insects caught; it is also possible to estimate the minimum actual distances they have travelled since leaving land and the minimum time they must have been in the air. Such distances are recorded up to 375 miles and minimum durations in the air up to 30 hours. The adaptation of insects to distribution by wind was discussed.

The Meeting then adjourned until 6 March 1947.

PROCEEDINGS OF THE ADJOURNED GENERAL MEETING ON 6 March 1947

The President introduced Miss THORA M. JAMES, of G.-B. Instructional Films, who showed the following 16-mm. films,—

Crustacea (which Mr. H. R. HEWER explained).
The life story of a Fern (which Miss THORA JAMES explained).
The Blow-fly (which Mr. H. R. HEWER explained).

(A discussion followed, in which Dr. Malcolm Smith and Mr. F. C. Grigg took part; Miss James replied.)

Colonel F. C. Stern, O.B.E., M.C., Vice-President, expressed the thanks of the Meeting to Miss James and G.-B. Instructional Films for showing these films to the Society.

A PLEA FOR A DESCRIPTION FROM LIFE OF THE AFRICAN DIOSCOREA MINUTIFLORA Engl.

By I. H. BURKILL.

(With 2 text-figures)

Twelve years ago Mr. F. C. Deighton, of the Sierra Leone Department of Lands and Forests, sent to the Royal Botanic Gardens, Kew, as no. 2872, the foliage and part of the rootstock of a *Dioscorea* which the southern Mendes call didi. At that time I could not determine sterile African material of its group; but I have since satisfied myself that this didi is *Dioscorea minutiflora*, a widely distributed forest climber, described in the first instance on rather inadequate material. I dealt with the consequent synonyms in 1939 in papers on the Dioscoreas of the Belgian Congo (Bull. Jard. Bot. de l'Etat, Bruxelles, **15**, p. 389; and Proc. Linn. Soc.. Lond., sess. 151, p. 59) and do not repeat them here; but to lead to the detection of the plant in the forest, I give the vernacular names that have been applied to it, though with the caution that many of them cover more species than this particular one; and in giving the vernacular names I shall indicate its distribution.

D. minutiflora is common in Sierra Leone and well known to those who move about the forests. The Mende names assigned to it are :—didi; mbuk and mbui, and mbongiei (the tuber); majaajei (known to be applied to other species); ugawi and vaiboi. The Temne names are :—ambunk or angbuk; ebuk (*vice* mbuk among the Mendes, and not restricted); ragbuk (the vine of ebuk); elik and possibly elekan; etrak; etankali; rakuban or rakubang; rawun; and ma-won-ma-rank. The Lokko call it ndegakge. These names have been taken chiefly from the labels of specimens at Kew. Another Mende name, kubara, is said to be used just outside the Colony.

Dr. A. Chevalier collected specimens which he determined as *D. minutiflora* (Bull. Mus. d'Hist. Nat. Paris, **8**, p. 548; 1936) in the inland forests of the Ivory Coast at localities between the Liberian border and the Sassandra river and applied these Bete names of the Sassandra valley :—tiri rikwa, tiri buru and tiri rikpo, which perhaps cover more than the one species. He indicated localities from the north-western parts of the Ivory Coast whence a collaborator named Portères sent to him the name yogo as used by the Dans or Dioulas.

D. minutiflora has been sent from Kibbi and Abetifi on the Gold Coast, with Twi names, aha-bayere and kokora.

It is undoubtedly a common plant in the Cameroons, whence it was that the type specimen came, being one collected by Buchholz on the Mongo river. Dr. R. Knuth records that Mildbraed obtained in the Cameroons as Kribi names, ebolūsŏŏ and dju or dju'b, and that dju is cultivated. It is evident that dju belongs to the grex of ' ji ' which means yam in a broad way among the Ibos of south Nigeria; so that ' dju ' cultivation would be expected, and the statement does not with absolute certainty show that the Kribis cultivate *D. minutiflora.*

The name emwui has come from Spanish Guinea, and the word ngwedugungu from the Gaboon. The latter was obtained by the Abbé Walker who states that the Bavungu eat the tubers in famine. Dr. Chevalier figured a small fragment of the rootstock and the leaves (in Rev. Bot. Appl. **18**, p. 36; 1938).

D. minutiflora occurs in the island of S. Thomé. Welwitsch who collected it there, attached to his specimen a Portuguese name, inhame de Benim, as if the plant had been brought into S. Thome from the continent of Africa, which is extremely unlikely, considering how inferior a food-plant it is.

An abundance from the Cameroons southwards to the mouth of the Congo is evident, and from this coast it spreads eastwards through the afforested northern parts of the Belgian Congo continuously almost to the Victoria Nyanza. Some of the collectors who have obtained it state that they did so in virgin forest, some in secondary forest, some in riverine forest, but the latter would not be swampy. The following are its vernacular names in the Belgian Congo. Firstly in the Province of Coquilhatville :—lite and litoie; ekoko, eloko, iloko and kolo; ikeke and mekiki; ekufe; engbo; elondomboto and londomboto; ligwa lalu; and moma (but moma is yam in the broadest way). Secondly in the Province of Léopoldville :—bala tadi (where bala or mbala means yam) diseke and perhaps lisaka; kokuta and kikuto; and lilela. Thirdly in the Province of Stanleyville :—bakwe and gwakwe and boka gwakwe; embene and embensa; egbene; amboke, embuke and emboke; kikokuta; likako and nabu.

In 1891 the explorer Franz Stuhlmann saw his famished carriers dig and eat tubers of wild yams, preparing what he calls a horrible meal; and he preserved a specimen of this species in illustration of the source. It was perhaps only one of several used. But we know that it is a famine food from collections made within the boundaries of Uganda in Unyoro by Dawe, by Maitland and by Snowden. They call the yam kama. Stuhlmann's journey was a little to the westward of Unyoro.

A locality in the Chulu range about 30 miles north of Kilimanjaro, apparently isolated, considerably further eastward, being in Kenya, has been revealed in collections made by Mr. P. R. O. Bally. There the plant is called madae.

Returning to the west coast of Africa, it has been obtained by Swainson Hall in the Portuguese colony of Kabinda, with the name of m'bala buunza; and in northern Angola in the Province of Cuanza norte at Cazengo, with the name of kanadi, according to Gossweiler.

Right or wrong, these names may aid any one who will seek for it.

Mr. Deighton described his plant as a very common tall-growing wild yam with a very spiny stem and a rootstock which scantily covered by the soil, grows to a diameter of a yard or more, giving rise to several stems. Downwards grow finger-like processes; and it is these, and these alone, which may serve as food; the upper surface of the rootstock is intensely armoured. Mr. Deighton states that some Mendes say that they eat the fingers, others that they do not; and those who say that they eat them, qualify the statement by adding, at certain stages of growth. He suggests that while the name didi is used by the southern Mendes, the Gba-mendes use majaajei, but do not restrict the name to it. A very similar opinion regarding its edibility is that given by Dr.

Chevalier who states that the Mendes living outside the colony of Sierra Leone and the Dans despise it, but the negroes of Liberia eat it as do the Betes and Gueres of the Ivory Coast.

I give here (fig. 1) a drawing of the part of the rootstock which Mr. Deighton sent to Kew, as seen in side view.

The reader will observe the descending fingers which may be eaten and the heavily armoured upper surface which protects them. How much larger the fingers become is one of the facts to be ascertained in the African forests. The part figured had been torn from the place where, in the previous year, there had been a leafy stem. In order that the whole be, as Mr. Deighton says, a yard or more across, it must be understood to be constructed as in figure 2.

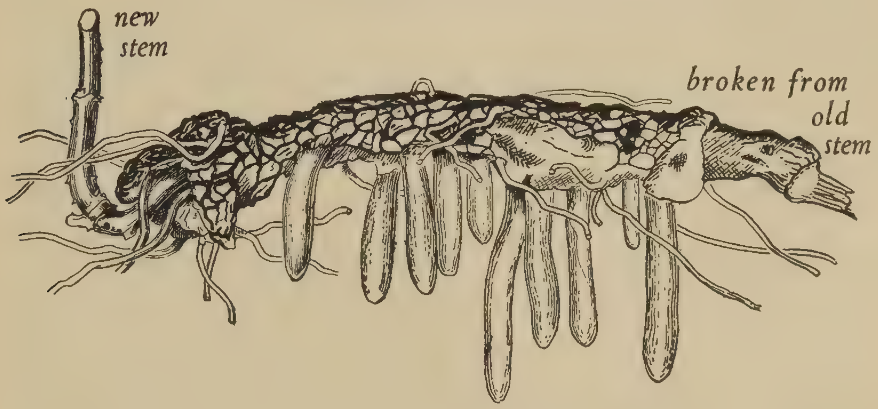

Fig. 1.—Part of the rootstock of *D. minutiflora* in side view. × ½.

The smooth areas in figure 1 appear to be cork-coatings developed where branches had been injured. Apparently the star of horizontal limbs which make up the rootstock lies like a mat just out of sight in the soil, covered in the same degree as may be the similarly heavily armoured upper surface of the flat tuber of *D. sylvatica* Eklon. Horticulturists grow *D. sylvatica* in our hot-houses with that armoured surface above ground, because soil, over-moist in Britain for the plant, would lead to injury ; in its dry home in south-eastern Africa it thrives out of sight ; and many a collector would seem to have gathered its flowers without having his attention directed to the more interesting structure under his feet. So with *D. minutiflora* it would seem necessary to remove a little soil in order to observe how the rootstock is constructed. Stuhlmann calls the tubers that his carriers ate, bitter ; and that they are chemically

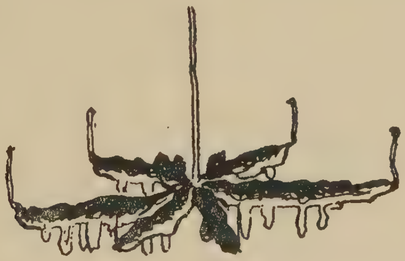

Fig. 2.—Restoration of the rootstock, showing new stems carried out at a little distance from the old stem.

protected is extremely likely, but should be demonstrated. It is not possible yet to know how close to each other the branches lie ; but that they themselves branch is demonstrated. They give rise to exploring roots, the remains of which are seen in figure 1. As is general in the Dioscoreaceae these slough off their cortex down to the endodermis and remain as anchors in the soil. How long they live in their naked state is not known.

In figure 1 on the left the ascending stem emerges from a pit and is flattened somewhat where it bends upwards. There the leader had been killed and the successful axis arose as a branch. Kew possesses another specimen of the horizontal part of the rootstock, namely, a specimen collected by Mr. Swainson Hall in Kabinda. It is equally woody and in the same way a prickly stem continues the horizontal arm, but it does not emerge from a pit. The pit therefore, may not be characteristic ; but when it occurs would seem to provide excellent protection to a resting bud. What seasons does the rootstock keep ?

Mr. Swainson Hall stated that the plant is cultivated in the Mayomba country, i.e. where Kabinda marches with the Belgian Congo. Cultivation probably means toleration amid the plants of a crop in shifting agriculture. When the crop is removed, the tolerated plants may be exploited if needed. If not exploited, they come by their own again in the returning forest. I have mentioned Mr. Deighton's record of the eating of the lower parts, and also Dr. Chevalier's and Stuhlmann's statements. Eating is recorded in the Belgian Congo in the Provinces of Stanleyville (Claessens) and Léopoldville (De Briey), and is presumed where Léopoldville and Kabinda meet (Swainson Hall).

The taxonomic position of *D. minutiflora* is not in doubt. It belongs to the section Enantiophyllum and to the immediate neighbourhood of *D. cayenensis* Lam., which is a native of Guinea and has races, such as that called ' odo ' in Fanti and Yoruba, strongly indurated at the head, but not, as this is, spread laterally ; and the new shoot emerges from the soil where the previous year's shoot emerged. It is in the mobility achieved by *D. minutiflora* that the greatest interest lies. Should a tree throw heavy encroaching shade over a plant of this wild yam, successful limbs move it out of the unsuitable position. No other African Dioscoreas have as yet been found mobile in this way. The section Stenophora, by reason of having rhizomes, shifts its position ; but is Asiatic with extensions to the Balkans on the west and to the United States on the east ; it does not enter Africa. Asia has none of the intense armouring which is seen in the African species *D. minutiflora*, *D. sylvatica* and *D. elephantipes*. The exact service of the armour may be worth study. The whole rootstock of *D. minutiflora* should be figured in situ ; and if seeds can be obtained a study of the building up of the young plant should be made. To end this communication, a classification of the forms that the rootstock takes in the genera *Dioscorea* and *Tamus* may be inserted to suggest evolution within the genera and at the same time to show in what way *D. minutiflora* seems to be the end of a new line of development.

A Key to the forms of rootstock characterizing Dioscorea *and* Tamus.

Base of stem extrudes one or more tuberous outgrowths which are converted into storage organs and for the sake of protection by the soil have positive geotropism at least at first.
  Extrusion done once only in the life of the plant, the result a perennial tuber.
    Stem renewed centrally at top of the tuber.
      Protection of tuber considerably by soil .... (1) *Tamus.*
      Protection of tuber by poisonousness .... (2) *D. sansibarensis.*
      Protection of tuber by armour .... (3) *D. elephantipes, D. sylvatica.*
    Stem renewed at margin of the tuber .... (4) *D. sinuata.*

- Extrusion repeated annually.
  - Perennial stem-base small.
    - Tubers 1 or few, so few that they do not interfere with each other in the soil.
      - Initial geotropism retained.
        - Tuber not or little lobed.
          - Protection as much chemical as by soil ...... (5) *D. bulbifera, D. hispida, D. dumetorum.*
          - Protection mostly by soil ...... (6) The greater number of the Dioscoreas.
        - Tuber lobed, the lobes not showing positive geotropism ...... (7) Some wild spp. and races of cult. spp.
      - Initial positive geotropism not retained and tubers tend to become horizontal ...... (8) Various spp. of Madagascar.
      - Initial positive geotropism reversed ...... (9) Peculiar races of *D. alata.*
    - Tubers many and interfering with each other in the soil; positive geotropism abandoned.
      - Protection mainly by soil ...... (10) *D. arachidna, D. orbiculata.*
      - Protection by thorny roots ...... (11) *D. esculenta.*
  - Perennial stem-base becomes an armoured woody knot which protects tuber below.
    - Knot a weedy cap.
      - Without added protection of thorny roots ...... (12) Races of *D. cayenensis.*
      - With addition of thorny roots ...... (13) *D. odoratissima.*
    - Knot grows out star-wise ...... (14) *D. minutiflora.*
- Base of stem extrudes no tubers, but becomes a horizontal food-storing rhizome ...... (15) Dioscoreas of the section Stenophora.

The sixth of these would seem to have been the most ancestral; and evolution to have proceeded from such a state. Mobility in the soil being advantageous, its attainment has been reached, and that independently, in Asia by nos. 10 and 11, by the whole of the section Stenophora; but in Africa by no more than the species with which this short paper is concerned.

The wide dispersal of *D. minutiflora* in Africa suggests that, as a successful plant, it owes much to its root-system.

OBITUARY.

Hans Driesch was born in 1867 and received his early education at Hamburg, followed by four years at the Universities of Freiburg, Munich and Jena. After making two visits to the Tropics he spent the better part of 10 years, from 1891 to 1900, at the Zoological Station in Naples. These were the great formative years of his life, when, in close association with brilliant workers like T. H. Morgan, Boveri and Herbst, he helped to lay the foundations of the young science of experimental embryology, working chiefly on Echinoderm material. His demonstration that whole embryos of smaller size could be produced by isolated blastomeres of the *Echinus* egg even at the 4-cell stage was a notable advance, and, together with his pressure experiments on the early stages of segmentation, it went far to upset Weismann's theory of the qualitative nature of nuclear division in development. The list of his papers during this exciting period (set out in Morgan's book on Regeneration, 1901) is a most impressive one. It includes not only many dealing with the experimental study of early Echinoderm development, but also a series on the remarkable form of regeneration shown by *Tubularia*, and, more significant still, a number of theoretical writings, notably his 'Analytische Theorie der organischen Entwickelung' (1894) and 'Die Lokalisation morphogenetischer Vorgänge' (1899). For Driesch from the very beginning was interested in the theoretical side of biology, stimulated thereto by the extraordinary phenomena of morphogenesis and regulation which he studied with such care, ingenuity and success. He early came to the conclusion that the 'machine-theory' of life was quite inadequate to account for development and heredity, and he showed himself a convinced vitalist in his paper of 1899. Important in this connection is his volume of 1901 'Die organischen Regulationen, Vorbereitungen zu einer Theorie des Lebens', and his researches on the phenomena of reduction and regeneration in *Clavellina*.

In 1900 he settled in Heidelberg and gradually his philosophical interests gained the upper hand over his research activities. To this period belong his books 'Die "Seele" als elementarer Naturfaktor' (1903) and 'Der Vitalismus als Geschichte und als Lehre' (1905) and his Gifford Lectures, delivered at the University of Aberdeen in 1907 and 1908, and later published in two volumes under the title 'The Science and Philosophy of the Organism' (2nd edition in one volume, 1929). These lectures appeared also in German as 'Philosophie des Organischen' (1909, 4th edition, 1928). This is his main work on theoretical biology, and I shall return to it later. Of special interest to English readers is the small book 'The Problem of Individuality' (1914) based on lectures delivered before the University of London in 1913. He was elected a Foreign Member of the Linnean Society in 1912. In the previous year he had become Professor of Philosophy at Heidelberg, a post which he held till 1920, when he occupied the same chair at Cologne. In 1921 he became Professor of Philosophy at Leipsic, and at the time of his death in 1941 he was Emeritus Professor at the same University. His principal philosophical publications were his 'Ordnungslehre' (1912, 2nd edition, 1923) and his 'Wirklichkeitslehre' (1917, 3rd edition, 1930). Later publications of biological interest were 'Die Maschine und der Organismus' (1935) and 'Die Uberwindung des Materialismus' (1935), also two papers in 'Acta Biotheoretica' in 1935 and 1937.

Driesch took a considerable interest in psychical phenomena and was in 1926–27 President of the Society for Psychical Research. He travelled extensively, and gave many lectures at scientific and philosophical congresses and at Universities. He received many honours, and the great value of his work in the philosophy of biology was widely appreciated, though it was much criticized and gave rise to many controversial writings. It cannot be said that his doctrine of entelechy was widely accepted, even by thinkers in general sympathy with vitalistic views, but his destructive criticism of the mechanistic theory of life was salutary and effective, and exercised a considerable influence on philosophical thought. In support let me quote an interesting passage from Bergson's 'L'Evolution créatrice' p. 45, f.n.). 'Il y a en effet deux parts à faire dans le néo-vitalisme contemporain : d'un côté l'affirmation que le mécanisme pur est insuffisant, affirmation qui prend une grande autorité quand il émane d'un savant tel que Driesch ou Reinke, par exemple, et d'autre part les hypothèses que ce vitalisme superpose au mécanisme ("entéléchies" de Driesch, "dominantes" de Reinke, etc.). De ces deux parties, la première est incontestablement la plus interessante'.

I had the privilege of attending Driesch's Gifford Lectures at Aberdeen in 1907, and of meeting him on several occasions. Now, on re-reading 'The Science and Philosophy of the Organism' after nearly 40 years, I am more than ever impressed by the amount of hard thinking he put into it. The book is one of the major efforts ever made to understand and give a rational account of the mysterious phenomena of development and adaptive response, and whether or not one accepts his theory of entelechy, which is a philosophical rather than a scientific concept, one must regard his work as a contribution of the first order, which can never be disregarded. There is much to be learnt from it at the present day, especially by those who imagine that biological phenomena can be explained in terms of the gene theory and natural selection. One thing is certain, that Driesch is assured of an honoured place in the history of theoretical biology. E. S. Russell.

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